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Effects of State Medicaid Policies on the Likelihood of Nursing Home Admission and Length of Stay: An Application of the Competing-risks Model

by Haruko Noguchi

A dissertation submitted to the Graduate Faculty in Economics in partial fulfillment of the requirement for the degree of Doctor of Philosophy, The City University of New York.

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Abstract

Effects of State Medicaid Policies on the Likelihood of Nursing Home Admission and Length of Stay: An Application of the Competing-risks Model

by Haruko Noguchi

Advisor: Professor Linda N. Edwards

The main purpose of this thesis is to investigate the influences of both an elderly person's health stock and the variation in Medicaid policies among states on an elderly person's risks of nursing home entry and discharge and the hazard of mortality (either in the community or in a nursing home), using the National Long-Term Care Survey (NLTCS). At first, I analyze these risk in a competing risks approach in two periods, 1982-1984 and 1984-1989, separately. Secondly, I extend the regression form of a semi-parametric hazard model to the model with time-varying covariates, which allows the effect of independent variables that vary over time.

I find that an individual's health stock at the start of each survey period, 1982-1984 and 1984-1989, has a significant positive effect on the probability of nursing home entry during the survey period. I also find evidence suggesting that some public support to an elderly person could materially affect his or her input price for long-term care. The presence of a "medically needy" program increases an elderly person's probability of institutionalization by approximately 30 percent during both study periods. In contrast, Medicaid coverage for home and community-based care decreases the hazard (probability) of nursing home entry by 19.9 percent in the study period 1982-1984. However, as to Medicaid coverage for home care, I cannot obtain a significant result from

the regression during the second survey period. Weekly average wage in Intermediate Care Facilities in the state as a proxy of the price of nursing home care affects an elderly person's use of nursing home care in both study periods.

If one controls for time-varying covariates, both effects of a Medicaid dummy variable and a proxy variable for the price of nursing home care on the risk of mortality in the community becomes significantly negative. The reason for this is that these covariates (an increase in the depreciation rate of an elderly person's health stock, losing a source of informal caregiving, and a decrease in economic resources among the elderly over time) are all conducive to an elderly person's hazard of death in the community.

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Above all, my parents deserve a lot of credit for putting up with my self-indulgence for the past 30 years. They have never been quite certain what I was doing with my life, but encouraged and trusted me enough to find my own way. I was glad to show my father the final draft of my dissertation before he passed away last summer. Also, I really owe much to my great-aunt who was really waiting for my graduation, but, unfortunately, she passed away in 1995. To my parents and to my great-aunt, this dissertation is respectfully dedicated.

January 20, 1997
Haruko Noguchi

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Introduction

In Japan, there is a proverb, "uba sute". It means discarding ("sute") the elderly, in particular, female elderly persons ("uba"), who could no longer work for society. The old story says that, by the rule of a village, children should bring their parents to a mountain far from a village, called "uba sute yama", to lay the elderly aside when their parents become a certain age. Nursing homes in the public sector were sometimes compared to the aphorism of "uba sute yama" until the beginning of the 1980s when society developed concern with the quality of nursing home care for the elderly. Most elderly persons preferred, and still do now, to stay in the community with their family unless they can afford a luxury care facility in the private sector.

In contrast to this Japanese proverb, there is an opinion which emphasizes valuable roles that the elderly can play in society. Since most elderly persons have already retired from economic activities, however, the roles to be considered are limited to activities inside the household. For example, in order to help other family members who are working outside, elderly persons can take care of domestic work such as taking care of their grandchildren and housekeeping. Also, they can educate the younger generation in the household in morals, religion, and traditions. This emphasis implies that household members will often benefit from living with elderly persons because the elderly can contribute to society, using their own human capital to produce other family members' human capital. Besides, this seems to be a good excuse to shift an obligation to provide care the elderly from the public to the household, since services given by family members are costless to taxpayers.

The Japanese proverb and the emphasis on the social role of the elderly are at two extremes, in that the former assumed that the elderly were a drain on society and the latter, that the elderly make a contribution to society. However, both examples centered on the value of the human capital of the elderly for society, and neglected the most important factors, namely, an elderly person's independence, preferences, and individual well-being. When considering care for the elderly, approaches involving both the public and the private sectors, and balancing both the foregoing factors and society's financial restrictions, are required.

The aging of the population is an inevitable result of economic development. Economic development led to the improvement of medical technology, which decreased infant mortality and increased life expectancy both at birth and at older ages. The United States is one of many countries which are experiencing a rapid growth of the elderly population. This demographic trend makes it necessary to consider how long-term care to support the daily life of the elderly should be managed not only financially but also with respect to the quality of services. The largest share of personal health expenditure on long-term care, in particular, nursing home care, in the United States is paid by government, more specifically, the Medicaid program, and the second largest part comes from out-of-pocket payments. The growth of need and the absence of insurance have been major factor in the present catastrophic situation in both private expenditure for long-term care and federal and state governments' spending on Medicaid. Public policies that allocate services efficiently to the elderly needing long-term care are required. To this end, considering long-term care in the framework of economics will help policy makers to determine the future direction for long-term care reform.

Long-term care is a large part of the problem of the elderly in the United States. The main purpose of this thesis is to investigate the influences of both an elderly person's health stock and the variation in Medicaid policies among states on an elderly person's risks of nursing home entry and discharge and the hazard of mortality (either in the community or in a nursing home), using the National Long-Term Care Survey (NLTCS).

This paper differs from previous studies on institutional care with respect to four points. (1) I include state Medicaid policy variables and examining the effect of the variation in state Medicaid policies on an elderly person's risk of nursing home admission. (2) Although Liu et al. (1991) focused on the effects of some state Medicaid policies on utilization of facility care, they did not distinguish Medicaid patients and out-of-pocket patients in their statistical model. Using both a Medicaid dummy and state Medicaid policy variables in the same regression will cause an endogeneity problem. (3) Liu et al. (1991) excluded state Medicaid policies from the equation to estimate the likelihood of mortality either in the community or in a nursing home. However, the Medicaid policies are still relevant to the likelihood of death because they will influence people's health status. (4) I control for time-dependent covariates, which would express an increase in the depreciation rate of an elderly person's health stock with age, losing a source of informal caregiving, and a decrease in economic resources among the elderly over time.

The first chapter provides an introductory discussion on long-term care for the elderly (persons aged 65 and over) in the United States. In this chapter, first, I will show the probable outlook for long-term care of the elderly in the United States, focusing on: (i) how the aging of the population will affect the needs for long-term care in the next several decades; (ii) what kinds of long-term care are provided; (iii) how the bills for long-term care have been paid. In the second section, I focus on long-term care for the elderly in Medicaid, with respect to: (i) the qualification of the elderly for Medicaid benefits; (ii) the types of service covered; (iii) historical trends of both the number of elderly beneficiaries and the Medicaid payments by type of service; (iv) variation in Medicaid long-term care policies for the elderly among states; (v) theoretical issues in the demand for Medicaid by a state; and (vi) public policies on long-term care in other OECD countries. Third, I will review previous studies on utilization of long-term care by elderly persons, with respect to (i) theoretical issues of long-term care; (ii) community-based paid and unpaid care; and (iii) institutional care. Finally, I outline the intended contribution of this thesis.

The second chapter presents theoretical considerations regarding the demand for long-term care of the elderly and develops the appropriate econometric specification to examine the theoretical hypotheses. In the first section of this chapter, I will apply a health production function to the theoretical modeling of the demand of the elderly for long-term care. Here, an elderly person's health is produced by three sources: institutional care, formal (paid) care, and informal (unpaid) community-based care. Therefore, the demand for each source is considered as an input demand which is derived from the demand for health and other consumption goods, and which depends on relative input prices. Consequently, various state Medicaid policies of principal interest for this paper will affect an individual's long-term care use through the input prices in the derived demand function. In the second section, I explain the econometric tools to be used to examine the influence of various factors on the utilization of long-term care for the elderly. To start, I analyze the effects in a competing risks approach. Then, I extend the regression forms of both semi-parametric and parametric hazard models to a model with time-varying covariates, which allows independent variables to vary over time. Finally, I describe the data features of the 1982-1989 National Long-Term Care Survey, which is the source of the data used for my empirical work.

In the final chapter, I show the regression results, and present a summary of this paper and a discussion of possible directions for further research. I find that an individual's health stock at the start of each survey period, 1982-1984 and 1984-1989, has a significant positive effect on the probability of nursing home entry during the survey period. I also find evidence suggesting that some public support to an elderly person could materially affect his or her input price for long-term care. For example, the presence of a "medically needy" program increases an elderly person's probability of institutionalization by 27.4 and 29.9 percents during 1982-1984 and 1984-1989, respectively, because it lowers the input price of nursing home care for the self-pay patients who face a high risk of "spend-down". In contrast, Medicaid coverage for home and community-based care decreases the hazard (probability) of nursing home entry by 19.9 percent because of a decrease in the price of community-based care relative to institutional care, if one holds the price of nursing home care constant. However, as to Medicaid coverage for home care, I cannot obtain a significant result from the regression during the second survey period. Weekly average wage in Intermediate Care Facilities in the state as a proxy of the price of nursing home care affects an elderly person's use of nursing home care in both study periods.

If one controls for time-varying covariates, both effects of a dummy variable indicating whether or not an elderly person has Medicaid policy variables and a proxy variable for the price of nursing home care on the risk of the risk of mortality in the community becomes significantly negative. The reason for this is that these covariates (an increase in the depreciation rate of an elderly person's health stock, losing a source of informal caregiving, and a decrease in economic resources among the elderly over time) are all conducive to an elderly person's hazard of death in the community.

Chapter 1

Overview

1. Introduction

In this section, I introduce the probable outlook for long-term care for the elderly in the United State, focusing on three topics: (i) how the aging of the population will affect the needs for long-term care among the elderly in the next several decades; (ii) what kinds of long-term care are provided; (iii) how the bills of long-term care have been paid and by whom.

Long-term care has different characteristics from medical care for acute illnesses. First, the aim of long-term care is to meet basic needs of daily life for those who have chronic mental and physical limitations which might be caused by conditions such as Alzheimer's disease, quadriplegia, osteoporosis, heart disease, multiple sclerosis, muscular dystrophy, and stroke. Second, unlike acute care given by health personnel such as physicians and nurses, long-term care is provided by many diverse caregivers, including not only nursing homes and health personnel but also family members and friends. Third, most long-term care services are covered neither by Medicare nor by private insurance. In order to utilize paid care, therefore, the disabled must rely on their own income and assets, or, when they have spent down their resources to the level required for Medicaid eligibility, Medicaid. The lack of coverage is a large factor in today's catastrophic situation in both out-of-pocket long-term care costs and federal and state governments' spending on Medicaid.

In the following paragraphs, I focus on more detailed characteristics of long-term care and I explain why long-term care studies have to be undertaken with in an economic framework.

1-1. Demographic trends in the United States

Like other economically developed countries, the United States is experiencing a dramatic growth of the elderly population. The number of the elderly, those 65 and over, which was about 31,560,000 (12.6% of the total population) in 1990, is projected to increase to 68,109,000 or 22.6% of the total population, in 2040[1]. The aging of the population in the United States is caused by three factors. First, infant mortality has decreased, which increased life expectancy at birth to 71.8 years for males and 78.6 years for females in 1989[2]. Second, the life span of the elderly has become longer. For example, the United Nations Demographic Yearbook shows that life expectancy at age 65 is 15.2 years for males and 18.8 years for females; and at age 80 it is 7.1 years for males and 9.0 years for females. Third, by about 2010 the aging of the baby-boomers will expand the elderly population.

The aging of the population will, in turn, increase the number of disabled elderly requiring long-term care because chronic manifestations of noninfectious diseases and their associated dependences are more common with increasing age. Long-term care is broadly defined as activities and interventions by which we

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[1] US Department of Commerce, Bureau of the Census, January 1989, Projection of the Population of the United States by Age, Sex, and Race: 1988 to 2080, Washington, D.C..

[2] The United Nations, 1993, Demographic Yearbook, Special Issue: Population Ageing and the Situation of Elderly Persons, New York, pp. 480-523, Table 7.

ameliorate and manage such dependences (Katz and Akpom 1976). Thus, the overall aim of long-term care is to help those who have chronic mental and physical limitations in their daily life. For long-term care providers, the ability to evaluate the degree of dependences is important for achieving efficiency and good quality of services. In order to determine whether an elderly person needs long-term care, the indices of Activities of Daily Living (ADLs) and Instrumental Activities of Daily Living (IADLs) have been generally used. ADLs measure an elderly person's ability to perform basic self-care tasks such as eating, bathing, dressing, mobility inside the home, going to and using the bathroom, and getting in or out of a bed (or chair). IADLs measure a person's capabilities with regard to more complicated daily achievements: doing heavy and light housework, doing laundry, preparing meals, getting around outside, shopping for groceries, managing money, and using the telephone.

Information about the present and future prevalence of disability presented by Manton (1989) indicate that (i) the community-based population of the elderly (65 and over) who have at least one limitation in ADLs, which was 5.5 million (19.2% of the total elderly population) in 1985, will increase to between 14 and 18 million (21.3% ~ 23.2% of total elderly population) in 2060; and that (ii) the institutionalized elderly population, which was 1.3 million (4.6% of all elderly) in 1985, will rise to between 4 and 5.5 million (6.2% ~ 7.1% of the total elderly population) in 2060[3].

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[3] Manton, K.G., 1989, "Epidemiological, Demographic, and Social Correlates of Disability among the Elderly", *The Milbank Quarterly*, Vol. 67, pp. 13-58, Table 3.

Later research based on the 1982-1989 National Long-term Care Surveys (Manton et al. 1995), however, reported that the chronic (90 and more days) disability prevalence rate has tended to decline and, especially for the highly impaired persons who have more than five limitations in ADLs or who are institutionalized, the decline rate is larger. The estimates shows that (i) the community-based population of the elderly who have at least one limitation in ADLs, which was 4,012,000 (13.0% of the total elderly population) in 1982, decreased by 0.3% to 3,905,000 (12.7% of all elderly) in 1989; and that (ii) the institutionalized elderly population, which was 1,883,000 (6.1% of all elderly) in 1982, declined by 0.6% to 1,685,000 (5.5% of all elderly) in 1989. Of particular interest for health care reform are those who have 5 or 6 limitations in ADLs or who are institutionalized. For this group, the decline is large at 0.5%: the elderly population in this category, which reached 2,994,000 (9.7% of all elderly) in 1982, fell to 2,518,000 (8.2% of the total elderly population) in 1989[4].

Increased life expectancy at the age of 65 and over has also been responsible for the growth of the oldest-old (85 and over) population in the US. Predictions about this group account for opposing perspectives on the future quantity of long-term care to be demanded by the elderly. One is that it will decline, as long as the society pays attention to the disabled and institutionalized elderly as one of the groups of special interest for health care reform. The other is that it will increase rather than decline. If the prevalence of morbidity among the oldest-old increases, the increase in the population aged 85 and over will raise the quantity of long-term care to be needed by

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[4] Manton, K.G., Stallard, E. and L. Corder, 1995, "Changes in Morbidity and Chronic Disability in the US Elderly Population: Evidence from the 1982, 1984, and 1989 National Long-term Care Surveys", *Journal of Gerontology: Social Sciences*, Vol. 50B, No. 4, pp. S194-S204, Table 2.

this age group. However, work by Manton et al. (1995) found that the prevalence rate of morbidity among the non-institutionalized oldest-old population decreased by 15.4% for males and by 10.7% for females; it declined by 11.2% for both sexes combined, from 1982 through 1989. The changes in the disability and institutionalization trends will significantly affect the prospective amounts and types of long-term care needed by elderly persons in the next several decades, and also they will make it necessary to consider how long-term care for the elderly should be managed not only financially but also with respect to the quality of services.

1-2. Classification of long-term care

Long-term care for the elderly can be categorized into the following two main types of care: institutional care and community-based care. The first type, institutional care, is provided by nursing homes, which are classified in terms of the level of care and certification status by Social Security's Medicare and Medicaid programs as follows: (i) skilled nursing facilities (SNFs), paid by Medicare; (ii) skilled nursing facilities (SNFs), paid by Medicaid; and (iii) intermediate care facilities (ICFs), paid by Medicaid. A SNF may be certified by both Medicare and Medicaid, and also a nursing home can be certified as both a SNF and an ICF, which is accomplished by allocating a specific number of beds in a nursing home to each certification status[5].

The second type, home and community-based services, includes the following five types of care: (i) case management, which assists beneficiaries in getting medical, social, educational, and other services; (ii) personal care, which includes bathing, dressing, ambulating, feeding, grooming, and some household services such as meal preparation and shopping; (iii) adult day care, including physical, occupational, and speech therapies and social and recreational activities adapted to compensate for any physical or mental impairments; (iv) respite care, providing relief to the primary caregiver of a chronically ill or disabled beneficiary; and (v) homemaker service, which assists beneficiaries with general household activities and may include cleaning, laundry, meal planning, grocery shopping, meal preparation, transportation to medical services, and bill paying[6]. All these services are provided by formal (paid) and informal (unpaid) caregivers.

According to the report of the General Accounting Office in 1995, the vast majority of all those (including those under 65) who say they need long-term care services do not live in nursing homes or other institutions. Out of elderly persons

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[5] The 1985 National Nursing Home Survey shows that 14,400 nursing homes (75.8% of total nursing homes) and 1,441,300 nursing home beds (88.8% of total nursing home beds) are certified by either Medicare or Medicaid, or both. Out of the 14,400 Medicare- and/or Medicaid-certified nursing homes, the largest proportion of nursing home, 5,700 homes (39.6% of total certified nursing homes), are certified as both skilled and intermediate care facilities; 5,300 homes (36.8%) provide only intermediate care; and 3,500 homes (24.3%) give only skilled care. Of 1,441,300 certified beds, more than half of the beds, 724,000 beds (50.2% of total certified nursing home beds) are held by the nursing homes certified as both SNFs and ICFs; nursing homes certified only as ICFs have 182,900 beds (28.4%); and those certified only as SNFs hold 307,900 beds (21.4%) (US Department of Health and Human Services, March 27 1987, "Nursing Home Characteristics: Preliminary Data from the 1985 National Nursing Home Survey", *Advancedata*, No. 131, Table 2).

[6] United States General Accounting Office, April 1995, "Long-Term Care: Current Issues and Future Directions", GAO/HEHS-95-109, Washington, D.C., p. 4.

who require long-term care (7.33 millions), 1.64 million live in institutions and the remaining 5.69 million are living in the community[7]. Most highly impaired elderly persons who need skilled nursing care live in the community, not in SNFs. The numbers of elderly persons receiving skilled nursing care in different settings under the hospital insurance (HI) program[8] of Medicare in 1992 are as follows (Table 1-1): living in SNFs[9], 759,000 (11.3% of the total elderly Medicare HI beneficiaries), and receiving home health services, 2,357,000 (34.9% of the total elderly Medicare HI beneficiaries). Table 1-1 shows that the number of home health care recipients as a percent of total Medicare HI beneficiaries increased dramatically from 6.6% to 34.9% from 1975 to 1992, while the number of SNF residents as a percent of Medicare HI beneficiaries increased only from 5.2% to 11.3% during the same period. Furthermore, the ratio of home health to SNF care beneficiaries, which was 1.3 in 1975, increased to 5.1 in 1987. This was influenced by the removal of some restrictions on home health agency (HHA) visits in the Omnibus Budget

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[7] United States General Accounting Office, April 1995, ibid., pp. 6-8.

[8] Medicare has two complementary but distinct parts: hospital insurance (HI), also called Part A, and supplementary medical insurance (SMI), also called Part B.
(1) The HI program covers 90 days of inpatient hospital care in a benefit period (spell of illness), which begins with the first day of hospitalization and ends when the beneficiary has not been an inpatient in a hospital or skilled nursing facility (SNF) for 60 continuous days. There is no limit to the number of benefit periods an individual may use. In addition to inpatient hospital care, the HI program covers up to 100 post-hospital days in an SNF if the beneficiary is certified to require such care. It also covers home health agency (HHA) visits.
(2) "Nearly everyone covered by HI voluntarily enrolls in SMI. Unlike HI, SMI requires a monthly premium payment. The SMI program provides payments for physicians as well as related services and supplies ordered by physicians. SMI also covers outpatient hospital services, rural health clinic visits, and home health visits." (Excerpt from US Department of Health and Human Services, June 1986, Health Care Financing Program Statistics, Medicare and Medicaid Data Book, 1984, Baltimore, Maryland, p. 5)

[9] Neither intermediate nor residential nursing home care is covered by Medicare. Residential nursing homes can be defined as facilities limiting care exclusively to persons with specific physical, mental, and emotional conditions.

Reconciliation Act of 1980 (Public Law 96-499). Effective July 1981, prior hospitalization is not required for covered HHA visits, and the limit of 100 visits no longer applies.

1-3. Long-term care expenditure

Although most persons requiring long-term care are living in the community, total (public plus private) expenditures on institutional care are much larger than spending on community-based care. More than sixty percent of total nursing home care expenditure is made by the government in 1993 (Table 1-2). About 8.9 percent ($69.6 billion) of total expenditure on personal health care ($782.5 billion) wend for institutional care, while 2.7 percent ($20.7 billion) went for home health care.

For both institutional and community-based care, the government paid the largest part of personal health care costs. Private health insurance paid for a much larger share of home health care than for nursing home care, whereas the shares of home health care paid by patients out-of-pocket and by government are less than the self-pay and government shares for institutional care. Out of total institutional care expenditure ($69.6 billion), $43.6 billion (62.6%) was made by the government; out-of-pocket payments and private health insurance accounted for $23.0 billion (33.0%) and $1.7 billion (2.5%), respectively. Out of total home health care ($20.8 billion), $11.4 billion (54.8%) was paid by the government; and out-of-pocket payment and private health insurance accounted for $4.3 billion (20.8%) and $2.5 billion (12.2%), respectively (Table 1-2). This could be interpreted as follows: (i) those who can afford private health insurance tend to utilize community-based care rather than institutional care; (ii) those who are poor and cannot buy private health insurance for home care would use nursing home care rather than community-based care, if there is public financing to support their use of nursing homes. Furthermore, the large share of institutional care paid by self-pay patients suggests that the risk of spend-down may increase, leading to a rapid increase in government spending on nursing home care in the near future. The foregoing statistics do not estimate the invisible indirect costs of home health care which arise because community-based care heavily depends on informal (unpaid) care by patients' children, relatives, neighbors, friends, or volunteers[10]. Loss of time from paid work by family caregivers has attracted attention because women's commitment to full-time employment may interfere with the supply of informal care (Boaz 1996).

The largest part of government spending on institutional care was paid by Medicaid. Unlike Medicare, which covers only skilled nursing home care, Medicaid covers both skilled and intermediate nursing home care. In view of the probable increase in the number of disabled elderly needing long-term care in the next several decades, the public expenditure on long-term care, especially Medicaid expenditure on nursing home care, might be expected to increase rapidly. The Brooking-ICF Long-term Care Financing Model estimates that (i) the number of elderly Medicaid

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[10] The estimate based on data from the National Long-Term Channeling experiment indicates that, 93.1 percent of disabled elderly persons who live in the community received combinations of formal and informal community-based care from caregivers either in or outside the household (the sample size is 1,927). The total amount of care received is 46.4 hours per week on average. Most of the care was provided informally by family and friends, 27.0 hours by caregivers living in the same household, 11.9 hours by those living outside the household, and only 7.3 hours by formal care (Kemper, P., October 1992, "The Use of Formal and Informal Home Care by the Disabled Elderly", *Health Services Research*, Vol. 27, No. 4, pp. 421-451, Table 3).

patients who received nursing home care, which was 1.4 million in 1993, will increase to 1.7 million in 2008 and to 2.0 million in 2018; and that (ii) total Medicaid expenditure on nursing home care for the elderly, which was $22.4 billion (41% of the total expenditure on institutional care for the elderly) in 1993, will rise to $35.4 billion (40%) in 2008 and to $49.0 billion (38%) in 2018, under the 5.5 percent inflation assumption[11]. Although Medicaid outlays as a percent of the total expenditure on institutional care for the elderly are estimated to decrease gradually, Medicaid will still account for the largest part of total institutional care expenditure.

In order to control the growth of public expenditures on nursing home care, public policies are necessary to provide appropriate services to help disabled elderly persons in the community to live as independently as possible and to make it easy to access community-based care. Such public policies could reduce the likelihood of institutionalization by improving the ability of elderly persons to stay in the community. Besides, most elderly persons prefer community-based care to institutional care, and community-based care may be less costly[12] than institutional care (Kemper, 1992). To aid in discussion of future policies, I investigate the characteristics of elderly persons who are more likely to be institutionalized and

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[11] Wiener, J. M., Illston, L. H., and R. J. Hanley, 1994, Sharing the Burden, Strategies for Public and Private Long-Term Care Insurance, The Brookings Institution, Washington, D.C., Tables 2-3 and 2-5.

[12] This is likely because community-based care heavily depends on informal (unpaid) caregivers. Formal (paid) health care services in the community are not necessarily less costly than nursing home care. In 1993, while average weekly wages in SNFs and ICFs were $301 and $267 respectively, the average wage in formal home health care services was $325, making formal community-based care more costly than institutional care. Information on average weekly wages is based on Employment and Wages, Annual Averages 1993, estimated by the US Department of Labor, the Bureau of Labor Statistics.

explore the impact of current public policies, especially Medicaid policies, on the probability of nursing home admission.

1-4. Conclusion

The previous discussion on long-term care for the elderly in the United States indicates, first, that increased life expectancy at age 65 and over would accelerate the aging of the US population because it leads to the growth of the oldest-old population. The demographic trend will affect significantly the amounts and types of long-term care that will be demanded by elderly persons in the future. Second, despite the greater needs for long-term care in the community, both public and private expenditures on institutional care are much larger than spending on community-based care. In other words, in spite of the strong preference of the elderly for staying in the community, "the available financing is highly skewed toward institutional care" (Wiener et al. 1994). For example, in the survey conducted by Consumers Union and the American Association of Retired Persons (AARP)[13], 57% of respondents said that their support for the Clinton health plan would increase if long-term care, in particular, community-based care, were included in health care reform[14]. Third, for both institutional and community-based care, the largest share of personal health expenditure is financed by the government, more specifically, the Medicaid program,

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[13] AARP, November 11 1993, "AARP Poll Finds Americans Want Long-Term Care as Part of Health Reform", AARP News, Washington, D.C.; ICR Survey Research Group of AUS Consultants, Media, Pa., 1993, "Long-Term Care Survey", prepared for AARP; and Gallup Organization, 1993, "Executive Summary", poll prepared for Consumers Union, Princeton, New Jersey.

[14] Wiener, J. M., Illston, L. H., and R. J. Hanley, 1994, ibid., p. 2.

and the second largest part is financed by out-of-pocket payments. This might be the reason for the critical situation in both out-of-pocket costs for long-term care and federal and state government spending on Medicaid.

Public policies that allocate services efficiently to the elderly needing long-term care and that balance needs and spending between community-based and institutional care are required. Considering long-term care in the framework of economics from both demand and supply aspects will help policy makers to find a future direction for long-term care reform. Long-term care studies in the framework of demand and supply could estimate how changes in economic factors such as prices and direct and indirect costs[15] affect an individual's service utilization and a service provider's decision making as to the amounts and quality of services. The sensitivity of amounts of long-term care demanded to economic factors may be influenced by people's preferences. Therefore, exploring the influence of economic factors on an elderly person's choice regarding long-term care is important not only to maximize his or her individual well-being, but also to achieve the appropriate allocation of services to meet people's requirements from the suppliers' perspective. However,

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[15] As in acute medical care, there are two kinds of costs for long-term care: direct and indirect costs. Direct costs are defined as amounts that are spent to purchase any kind of long-term service and equipment, which contribute to the health care expenditure component in GDP. Indirect costs are much more difficult to estimate than direct costs, because they are not directly calculated in money terms. While the costs of institutional care are direct costs, costs of community-based care include both direct and indirect costs. For instance, the costs of utilizing services provided by formal caregivers; and special equipment purchased to help in daily living such as wheelchairs, walkers, diapers, cane, urinary catheters and colostomy bags; and expenses of modifying a home are considered as direct costs. But community-based care heavily depends on services given by informal caregivers, whose opportunity costs can be defined as indirect costs. In order to obtain precise home care costs, we have to estimate these opportunity costs. However, little of the information necessary to calculate opportunity costs is available, e.g., time spent on care, and average hourly wage before/after a caregiver changes/quits a job to take care of an elderly person. The Survey of Informal Caregivers in the 1982 National Long-Term Care Survey includes some information on indirect costs.

studies of direct and indirect costs of long-term care are also consequential in investigating how efficiently and how properly services are provided to elderly persons.

Whereas a substantial amount of research has been conducted on institutional and formal community-based care, in particular from the demand side, few studies on informal home care have been done in the field of economics, because we have little information on economic factors in informal care, especially on opportunity costs of caregivers in the household. In view of the demographic trend of a decline in the institutionalized elderly population, the strong preference of the elderly for staying in the community, and the present catastrophic situation in both out-of-pocket health care costs and federal and state government spending on Medicaid, it is likely that long-term care for the elderly in the future will heavily rely on informal caregivers in the community. Since informal care for the elderly is supported females in a household, however, an increase in females' labor force participation on full-time basis in the future will lead to the lack of source for caregiving in the community. This creates a need for studies that focus on informal community-based care in order to determine the future direction of long-term care for the elderly.

In this study, I will investigate the impact of both an elderly person's health stock and current public policies, that is, the variation in Medicaid policies among states, on an elderly person's utilization of nursing home care, using the National Long-Term Care Survey (NLTCS). I will also explore the influences of these factors on nursing home discharge and the hazard of mortality (either in the community or in a nursing home). First, I analyze these risks in a competing risks approach. Second, I extend the regression form of a semi-parametric hazard model to the model with time-varying covariates, which allows independent variables to vary over time.

2. Background

In this section, as the background of this study, I focus on long-term care for the elderly in Medicaid, with respect to (i) criteria for the qualification of the elderly for the Medicaid benefits; (ii) the types of service to be covered; (iii) historical trends of both the number of elderly beneficiaries and Medicaid payments by type of service; (iv) the variation in Medicaid long-term care policies for the elderly among states; (v) each state's decision-making on the level of Medicaid in economic theory; and (vi) public policies on long-term care in other OECD countries. Medicare and Medicaid became law in 1965. The 1965 law amendments to the Social Security Act of 1935.

2-1. Overview of Medicaid program

Unlike Medicare, which is a federally administered program, the Medicaid program is run by each state under broad federal guidelines; states determine who is covered, what services are available to recipients, and how providers are reimbursed for their services. Unlike Medicare[1], Medicaid is a means-tested program. As shown in Table 1-3, the Medicaid program covers all those who receive cash payments from the Aid to Families With Dependent Children (AFDC) program and most persons receiving assistance from the Supplemental Security Income (SSI) program, at a minimum. Those who receive AFDC and SSI cash assistance are defined as the

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[1] The Medicare program covers hospital, physician, and other medical services for most persons 65 years of age or over, disabled persons, and blind entitled to social security cash benefits for at least 24 months. The amounts are the same for those who receive benefits, regardless of their income, but Medicare beneficiaries have to copay for services (US Department of Health and Human Services, June 1986, Health Care Financing Program Statistics, Medicare and Medicaid Data Book, 1984, Baltimore, Maryland, p. 5).

"categorically needy" or "categorically eligible", which consists of mandatory and optional eligibility groups. States have the option of extending Medicaid coverage to the "medically needy", who are defined as individuals in categories related to AFDC and SSI who are ineligible for cash assistance on the basis of income and financial resources but whose income and resources are considered insufficient to meet their medical needs.

There are two kinds of service, mandatory and optional services, to be provided by the Medicaid program. The mandatory services, which are funded by the Federal government, include inpatient and outpatient hospital services; rural health clinic services and any other ambulatory services offered by a rural health clinic and otherwise covered under the State plan; Federal qualified health center (FQHC) services and any other ambulatory services offered by a FQHC and otherwise covered under the State plan; laboratory and X-ray services; nursing facility services for individuals 21 years of age or over; early and periodic screening, diagnosis, and treatment services for individuals under 21 years of age; family planning services and supplies; physician services; medical and surgical services furnished by a dentist; home health services for individuals entitled to nursing services; nurse-midwife services; and certified pediatric nurse practitioner and certified family nurse practitioner services. The optional services that states may provide include medical or remedial care recognized by state law and furnished by licensed practitioners (e.g., podiatrists, optometrists, chiropractors, and psychologists) within the scope of their practices as defined by the State; private duty nursing services; clinic services; dental services; physical therapy, occupational therapy, and services for persons with speech, hearing, and language disorders; prescribed drugs; dentures, prosthetic devices, and eyeglasses; diagnostic, screening, preventive, and rehabilitative services; inpatient hospital and nursing facility services for individuals 65 years of age or over in an institution for mental diseases; services in an intermediate facility care for the mentally retarded (ICF/MR); inpatient psychiatric facility services for individuals under 21 years of age; hospice care; case-management services; tuberculosis-related services; respiratory care services; home and community care for functionally disabled elderly individuals; community-supported living arrangement services; personal care services; and any other medical care or remedial care recognized under state law as specified by the Secretary of the Department of Health and Human Services[2].

The costs of Medicaid are financed cooperatively by the Federal and state governments. The percentage of Medicaid paid by the Federal government is determined annually for each state by a formula that compares the state's average per capita income level to the national average. By law, the percentage cannot be lower than 50% nor greater than 83% of total state Medicaid program costs. The state contribution to Medicaid financing consists of the non-Federal portion of payments for services and the non-Federal portion of program administrative costs. The non-Federal share of payments for services, which must be at least 40% of the non-Federal share, comes from the state or local revenues. The state also must guarantee that a

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[2] US Department of Health and Human Services, 1995, Health Care Financing Review, 1995 Statistical Supplement, Baltimore, Maryland, pp. 121-122.

lack of local funds will not result in reduced amounts, duration, scope, or quality of care provided to Medicaid recipients. Furthermore, the state is entirely responsible for the costs of services to state-only eligibles and for additional services it offers that do not qualify for Federal financial participation[3].

Statistics on the number of Medicaid beneficiaries and government expenditures for Medicaid from 1975 through 1993 issued by the US Department of Health and Human Resources shows that: (i) the number of Medicaid beneficiaries was increased by 51.9 % during this period, while state and federal government expenditures for Medicaid in 1993 amounted to about ten times as much as in 1975; (ii) the growth of the Medicaid payments for the aged accounted for the second largest amount of the increase of Medicaid payments during this period, although the number of aged beneficiaries tended to decrease from 1975 through 1992; and (iii) the greatest average annual rate of change in the Medicaid payment per beneficiary during 1975-1993 has occurred among the aged. Details follow:

The number of Medicaid beneficiaries[4] is measured by those who use any health care services billed to Medicaid. On the basis, the percentage of the United States population covered by Medicaid was relatively stable from 1980 through 1990, with a range of 8.2% to 8.6% (21.6~25.3 million persons); but increased to 11.5% (33.4 million persons) in 1993. For the period 1975 - 1993, the number of Medicaid beneficiaries was

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[3] Ibid., p. 123.

[4] As percents of total Medicaid beneficiaries, the disabled increased from 11.2% to 15.0% between 1975 and 1993; the total of low-income children and adults increased from 64.2% to 71.1%; and the aged decreased from 16.4% to 11.6% (Ibid., p. 359, Table 105).

increased by 51.9 percent, from about 22.0 million to 33.4 million persons[5]. However, the number of aged Medicaid beneficiaries decreased over the decade, until 1992, when the number rose to exceed the 1975 level, and for the period 1975 - 1993, the number grew by only 6.9%, from 3.6 million to 3.9 million elderly persons.

State and federal expenditures for Medicaid[6] in 1993 amounted to about ten times as much as in 1975. During this period, they increased from $13 billion to $131 billion, the share of federal government rising from $7 billion to $75 billion, and the share of state government, from $6 billion to $56 billion. The increase in Medicaid expenditure from 1975 through 1993 was mostly accounted for by increases in Medicaid payments for the disabled and the aged. The proportion of Medicaid payments for the disabled increased from $3.1 billion in 1975 (25.7% of total Medicaid expenditure) to $38.7 billion in 1995 (38.0%). During this period, Medicaid payments for the aged accounted for the second largest amount of payments, increasing from $4.4 billion (35.6% of total Medicaid expenditure) to $31.6 billion (31.0%), although the number of aged beneficiaries tended to decrease from 1975 through 1992[7]. The increase in the annual Medicaid payment per elderly beneficiary was larger than increases in the annual Medicaid expenditures per

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[5] The greatest rate of change during the period occurred among disabled Medicaid beneficiaries, increasing from 2.5 million to 5.0 million persons. The low-income children and adult eligibility groups increased by nearly 70%, from 9.6 million to 16.3 million children, and from 4.5 million to 7.5 million adults. This is partially caused by the Medicaid expansions for pregnant women, infants, and children enacted in the late 1980s.

[6] Ibid., p. 370, Table 111.

[7] In contrast, from 1975 to 1993, the percents of Medicaid payments for low-income children and for adults decreased from 17.9% ($2.2 billion) to 16.2% ($16.5 billion), and from 16.8% ($2.1 billion) to 13.4% ($13.6 billion), even though the low-income children and adult eligibility groups increased by almost 70% during the period. When adjusted for medical service inflation and expressed in 1993

low-income child and adult[8]. The Medicaid payments per beneficiary grew from $1,205 and $1,276 to $8,168 and $7,706, representing rate changes of 577.9% and 503.9% for the Medicaid aged and disabled, respectively, while payments per beneficiary for low-income children and adults rose from $228 and $455 to $1,013 and $1,813, respectively, increases of 344.3% and 298.5%, respectively. After adjustment for inflation, the greatest average annual rate of change has occurred among aged and disabled beneficiaries, but payments remained flat for low-income children and adults[9].

2-2. Long-term care for the elderly in Medicaid program

In this study, I restrict my focus to long-term care coverage for the elderly in the Medicaid program. As discussed before, the increase in Medicaid payments for the elderly accounted for the second largest amount of increase in total payments, although the number of aged beneficiaries tended to shrink from 1975 through 1992. And the greatest increase in Medicaid payments per beneficiary has occurred among the elderly. Among elderly persons, who qualifies for Medicaid benefits, and what kind of long-term care services are included? How much do the federal and state

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dollars, from 1975 through 1993, the Medicaid payments for the disabled, the aged, low-income children and adults increased from $12.2 billion to $38.7 billion; $16.9 billion to $31.6 billion; $8.5 billion to $16.5 billion; and $8.0 billion to $13.6 billion, respectively (US Department of Health and Human Services, 1995, ibid., p. 150).

[8] Ibid., p. 371, Table 112.

[9] When adjusted for medical service inflation and expressed in 1993 dollars, from 1975 through 1993, Medicaid payments per beneficiary for the disabled, and the aged, low-income children and adults increased from $4,962 to $7,706; $4,687 to $8,168; $885 to $1,013; and $1,770 to $1,813, respectively (Ibid., p. 152).

governments spend on Medicaid for the elderly for each type of services? What are the historical trends of both the number of elderly beneficiaries and the Medicaid payments by type of service?

Regardless of type of service, there are three conditions that persons must meet to be declared eligible for Medicaid:[10] (i) they must quality as categorical needy, i.e., the applicant must be a member of one of the several groups specified in the federal statute as eligible for coverage (see Table 1-3), and the elderly (age 65 and older) meet this test by definition; (ii) resources (assets) [11] available to the applicant must be below the state-defined standard; and (iii) current income must be below the state-defined standard.

As explained in section 1-2, long-term care for the elderly consists of two main types: nursing home care and community-based care. In order to receive nursing home care paid for by Medicaid, the following two additional criteria have to be met: (iv) a Medicaid-certified nursing home bed must be available; and (v) the applicant must need the level of care provided by a nursing home. Rules for receiving community-based care were affected by the Omnibus Budget Reconciliation Act (1981), section 2176, which permitted states to apply for "home and community-based services" (HCBS) waivers under Medicaid for frail elderly persons who need assistance because of limitations in ADLs and IADLs. The Health Care Financing

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[10] Newschler, E., September 1987, Congressional Research Service, Medicaid Eligibility for the Elderly in Need of Long Term Care, p. 5.

[11] "Resources refer to liquid assets such as cash on hand, saving and checking accounts, stocks, bonds, mutual fund shares, and promissory notes, as well as real and personal property (nonliquid assets) such as automobiles and rental property. This is the definition used in the SSI program." (Excerpt from Newschler, E., September 1987, ibid., p. 8)

Administration (HCFA) describes the HCBS waivers as follows: "HCBS services are available only to persons who have been determined to need the level of care provided in skilled nursing facilities, and projected costs are reviewed very closely by HCFA to assure that providing these additional, non-medical services will not raise the Medicaid expenditure level" (Newshler 1987).

Medicaid payments for the elderly in 1993 for long-term care accounted for the greatest part of total Medicaid expenditure for elderly persons, although most elderly beneficiaries spent under Medicaid for acute care only. The number of elderly Medicaid beneficiaries in 1993 receiving acute care from providers of prescription drugs, physician services, and outpatient and inpatient hospital services is more than for long-term care furnished by ICF/MR, nursing facility[12], and home health providers (Table 1-4). Three million persons, or 76.5% of the total elderly Medicaid recipients (about 3.9 millions)[13], used Medicaid for prescription drugs; 2.6 million (66.5%) persons used it for physicians services; 1.3 million (34.6%) persons used it for outpatient hospital care; and 0.9 million (23.5%) had inpatient care in hospitals. Long-term care payments under Medicaid were made for care in nursing facilities for 1.4 million (35.5% of all elderly Medicaid beneficiaries) persons, followed by 0.4 million (9.2%) persons with home health services; and 0.01 million (0.3%) for

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[12] "Beginning in fiscal year 1991, the conditions of participation for SNFs and ICF-Other were unified, the distinction between them removed, and the services renamed nursing facility services. It is possible that the combined number of recipients includes some persons who used both types of nursing facility care during the reported fiscal year. This could somewhat inflate the number of users and lower the average payments per recipient." (Excerpt from US Department of Health and Human Services, 1995, ibid., p. 367)

[13] A person receiving multiple services is included once in the user count for each type of service and once in the total.

ICF/MR. From 1975 through 1993, however, the average annual rate of change in the number of elderly Medicaid beneficiaries is greater for long-term care than for acute care except for outpatient hospital care (Table 1-4). During the period, the largest average annual rate of change in the number of elderly Medicaid beneficiaries occurred among those using ICR/MR (6.9%); the rates of change for other service types used by elderly persons are: home health care (6.5%); hospital outpatient care (3.4%); nursing facilities (1.6%); hospital inpatient care (1.0%); physicians (0.7%); and prescription drugs (0.6%).

Medicaid payments for the elderly in 1993 for long-term care, including ICF/MR, nursing home, and home health care, accounted for 76.8% of total Medicaid expenditure for elderly persons, although the number of elderly using Medicaid for acute care is greater than for long-term care (Table 1-5). The largest portion of Medicaid outlays, $21.2 billion (67.2% of the total Medicaid payment for the elderly), was spent for nursing facilities, SNFs and ICFs other than ICFs for mentally retarded; with $2.4 billion (7.7%) being spent for home health; and $0.6 billion (1.9%) for ICF/MR. This indicates that Medicaid payments per aged beneficiary for long-term care are higher than for acute care. In 1993, the highest Medicaid payment per beneficiary for long-term care is $60,901 for ICF/MR; $15,467 was spent for nursing facilities; and $6,659 for home health. As to acute care, the highest expenditure per beneficiary is $2,225 for hospital inpatient services, $826 for prescribed drugs; $304 for hospital outpatient services; and $190 for physicians[14]. From 1975 through 1993, the greatest average annual rate of change in Medicaid payments for the elderly

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[14] US Department of Health and Human Services, 1995, ibid., p. 375, Table 116.

occurred among those using home health care (20.0%), the other types, in order of magnitude of rates of change, here: ICF/MR service; hospital outpatient care (12.8%); hospital inpatient care (12.4%); prescription drugs (11.8%); nursing facility services (9.1%); and physicians' care (6.7%) (Table 1-5).

Medicaid is the most important program for long-term care for the elderly, especially with respect to nursing home care (Cutler and Sheiner 1993). Payments for long-term care accounted for 76.8% of total Medicaid expenditure for elderly persons. Medicaid provides long-term care in nursing homes and the community, for those who have no "crisis" event leading to hospitalization, and, therefore, who do not meet the requirements for SNF coverage under Medicare, yet who may become unable to function in the community. Most elderly persons requiring long-term care are either ineligible for Medicare SNF coverage or they promptly use up their covered days, while they continue to stay in nursing homes indefinitely. Furthermore, the Medicaid program achieves its primary purpose, provision of care for "the poor", with respect to long-term care for the elderly (Phelps 1992).

2-3. State Medicaid long-term care policies for the elderly

Since the Medicaid program is run by each state under broad federal guidelines, states determine who is covered, what services are available to recipients, and how providers are reimbursed for their services. Thus, the program Medicaid differs markedly from state to state.

As a basic criterion of Medicaid eligibility for the aged (and blind and disabled), 32 states follow the Federal Supplemental Security Income (SSI) rules determined by the Social Security Administration (SSA). These states extend Medicaid coverage to all Federal SSI recipients, the "categorically eligible" group, without requiring separate applications to Medicaid. Also, Section 1902(f) of the Social Security Act allows states to impose restrictions rather than providing Medicaid automatically to all categorically eligible persons. Under categorical eligibility, only the elderly whose income is very low can receive Medicaid for nursing home care. Eighty percent of non-institutionalized Medicaid recipients but only 22 % (0.33 million out of 1.5 million) of recipients in intermediate care facilities (ICFs) or skilled nursing facilities (SNFs) qualify under categorical eligibility[15]. Table 1-6 presents basic requirements in each state for eligibility for elderly persons seeking Medicaid coverage of nursing home care. Note that all states which use lower resource standards than the SSI rules (Connecticut, Indiana, Missouri, Nebraska, North Carolina, and Ohio) also specify a more restrictive rule for Medicaid eligibility than the SSI standard ($1,800). Fourteen states termed "209(b) states" including the foregoing five apply more restrictive rules for Medicaid eligibility than states which followed the SSI rules permitted under the Social Security Act.

States have two programs to pay for such care using Medicaid. One is coverage for the "medically needy" group. They are defined to be the elderly who do not receive SSI payments, but who do not have enough resources and income to

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[15] Cutler and Sheiner, March 1993, "Policy Options for Long-Term Care", *NBER working paper* No. 4302, p. 14.

afford nursing home care or pay medical bills. For them, medical expenses are deducted from income in determining an elderly person's eligibility for Medicaid as medically needy. States can extend Medicaid to persons whose current income is less than the cost of care in a nursing home, even if their income significantly exceeds cash assistance levels. Thirteen states do not have medically needy coverage for the elderly at all; seven states have medically needy programs for the elderly without coverage for long-term care; and three states do not have a regular medically needy program but do cover nursing home care services or medical bills under a "spend-down" process (Table 1-7).

The second type of Medicaid coverage for those not "categorically eligible" is long-term care coverage for the group to which the "300% Rule" can be applied. By federal law, for those whose incomes exceed the SSI standard, states may establish a separate income standard not more than three times the basic SSI payment level. In 1987, the limit of income was $1,020 ($340 times 3) per month. Twenty-two states used this special income standard.

In 1981, the Omnibus Budget Reconciliation Act, section 2176, permitted states to apply for "home and community-based services" (HCBS) waivers under Medicaid for frail elderly persons with limitations in ADLs and IADLs. Thirty-seven states have this HCBS waiver program, and about 59,000 elderly persons were served in 1987 (Table 1-7). The Medicaid coverage for home care lowers the price of this type of care relative to institutional care.

Some states have a preadmission screening program as a mechanism to assure that public resources are allocated only to those elderly who need nursing home care. The purpose of this program is, therefore, to avoid "moral hazard" in the utilization of nursing home care for the elderly. Preadmission screening (PAS) was defined by InterStudy's Center for Aging and Long-Term Care as "an assessment used to determine the need and appropriateness of nursing home placement that goes beyond financial eligibility criteria and a physician's review to include an on-site assessment of the client's need by a disinterested third party". The assessment has to be completed before admission, and procedures that only include a record review of client information are not considered PAS[16]. There are two kinds of PAS programs: one for "immediate Medicaid eligibles", that is, for those who have already been Medicaid eligible or who would be eligible immediately on the nursing home admission; and the other for "expected Medicaid eligibles", that is, for currently self-pay patients who are expected to become Medicaid eligible by the end of a certain period (of which definitions are different among states) after the nursing home admission. Twenty-eight states have the former PAS program as a required condition to obtain Medicaid for either SNF or ICF services and nine states also have the latter program (Table 1-7). The definition of "a certain period" varies: 60 days (Illinois), 180 days (Georgia, Minnesota, Nevada and Virginia), and "soon" (Delaware). Some states do not specify period but apply the latter PAS program to all private patients

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[16] Iversen, L. H., March 1986, "A Description & Analysis of State Pre-Admission Screening Programs", InterStudy's Center for Aging and Long-Term Care.

(Indiana), or all private patients whose monthly incomes are less than 300% of the current federal SSI payments (Colorado and Oregon).

2-4. Demand for Medicaid by a state

How does each state determine the level of Medicaid expenditure? Phelps (1992) uses the utility function of a state's "governor" to explain this. Suppose that a state's demand function can be defined for two commodities which provide utility to the governor, Medicaid to the elderly or the poor, and other public goods, such as roads and parks. In order to create his or her utility, the governor may decide to purchase Medicaid from the federal government, spending the state's own income (which equals tax revenue). Therefore, "we can think of each state as "demanding" a level of Medicaid, and the federal government "supplying" Medicaid, where the price of Medicaid is the sharing rate between the federal and state governments" (Phelps 1992). This rate depends on the ratio of a state's average per capita income level to the national average (see section 2-1). As the ratio changes, the price of Medicaid faced by a state will also change.

As in an individual indifference schedule, both income and price effects can be observed as follows (see Figure 1-1). Suppose that the current level of a state tax revenue corresponds to the line I_0-I_0 in Figure 1-1. An increase in a state's tax revenue would shift the budget line from I_0-I_0 to I_1-I_1. Therefore, a state's spending on Medicaid will also expand from M_1 to M_3 along the E path, which shows an analog to the "Engel curve" in consumer demand theory, mapping any possible combinations of income and Medicaid spending. Nonetheless, because the price of Medicaid increases if per capita income of those who living in the state grows so that the ratio of a state's average per capita income level to the national average rises, the new budget line can be represented by I_1-I_2, rather than I_1-I_1. Thus, a state will decide the level of Medicaid to be purchased at M_2. The increase from M_1 to M_3 shows the "income effect", and the scale back from M_3 to M_2 represents the "price effect" on the state's demand for Medicaid.

How does a state achieve the level of Medicaid to be purchased from M_1 to M_3 and M_3 to M_2. Suppose that a state's tax revenue increases because of an increase in a state's average per capita income and that the federal government decided to reduce its payment to the state, or that the price of Medicaid relative to other commodities increases, the price of other goods being held constant. Then, the state will decrease both the number of Medicaid eligibles and Medicaid benefits per capita. Five groups that Medicaid might serve are low-income children and adults, the aged, the disabled, and others. If one assumes the number of beneficiaries and the Medicaid benefits per capita in the i th group to be N_i and B_i, respectively, the total state Medicaid spending can be defined as:

$$M = \sum_{i=1}^{5} N_i B_i \qquad \text{.......... Eq. 1}$$

Suppose that the number of beneficiaries and the per capita Medicaid benefits in each of the categories may independently respond to the change in federal payment for Medicaid to the state, S. The behaviors responding to the change in S are assumed to be different among these five Medicaid beneficiary groups. The change in N and B with respect to the change in S in the i th group can be expressed as dN_i /dS and dB_i /dS, where i = low-income children and adults, the aged, the disable, and others. Therefore, the change in total Medicaid spending with respect to the change in federal subsidy may be given by:

$$dM/dS = \sum_{i=1}^{5}\left(B_i(dN_i / dS) + N_i(dB_i / dS)\right) \text{ .... Eq. 2}$$

The next step is to define the elasticities associated with each of these derivatives. ε_{MS} = [(dM/dS)(S/M)] represents the elasticity of total Medicaid with respect to the federal subsidy; and ε^{i}_{NS} = [(dN_i /dS)(S/N_i)] and ε^{i}_{BS} = [(dB_i /dS)(S/B_i)] show the elasticities of the number of beneficiaries and the per capita Medicaid benefits with respect to the federal subsidy in the i th category, respectively. Finally, the total price elasticity of Medicaid can be provided by:

$$\varepsilon_{MS} = \sum_{i=1}^{5}[N_iB_i / M](\varepsilon^{i}_{NS} + \varepsilon^{i}_{BS}) \qquad \text{.......... Eq. 3}$$

Thus, the price elasticity of total Medicaid spending can be expressed as the sum of the elasticities for the number of beneficiaries and Medicaid benefits per capita, weighted by the spending in each group relative to the total Medicaid expenditure.

A state's budget constraint can be given by the following equation:

$$I = \sum_{i=1}^{5} N_iB_i + O \qquad \text{......... Eq. 4}$$

where O stands for a state's spending on other commodities. Suppose that the federal subsidy, S, is held constant. Then, the changes in N and B in the i th group with respect to the change in a state's income can be expressed as dN_i /dI and dB_i /dI.

Also, the rate of change in a state's spending on other commodities can be given by dO/dI. Therefore, the change in total Medicaid spending with respect to the change in the state's tax revenue may be given by taking a total derivative of Eq.4:

$$1 \equiv dI/dI = \sum_{i=1}^{5}\left(B_i(dN_i / dI) + N_i\,(dB_i / dI)\right) + dO / dI \qquad \text{.......... Eq. 5}$$

Next I define the income elasticities associated with each of these derivatives. $\eta'_{NI} = [(dN_i / dI)(I/N_i)]$ and $\eta'_{BI} = [(dB_i / dI)(I/B_i)]$ show the elasticities of the number of beneficiaries and per capita Medicaid benefits in the i th category with respect to the state's income, respectively. And, $\eta_{OI} = [(dO/dI)(I/O)]$ represents the income elasticity of other goods.

Finally, the total income elasticity of Medicaid can be provided by:

$$1 \equiv dI/dI = \sum_{i=1}^{5}[N_i B_i / I](\eta'_{NI} + \eta'_{BI}) + [O / I]\eta_{OI} \qquad \text{.......... Eq. 6}$$

If one assumes that a change in a state's tax revenue is all spent for either public good, the weighted average of income elasticities of a state's demand for Medicaid and the other good is unity, the weights being the relative shares of each commodity in total spending (Layard and Walters 1978).

Phelps (1992) introduced the findings of Granneman (1980) on both price and income elasticities of a state's Medicaid spending. Granneman (1980) estimates the demand for Medicaid by a state in terms of three eligible groups, low-income children and adults who are supported by AFDC program; and the elderly. The results showed that (i) all price elasticities for the number and per capita benefits of AFDC child and adult recipients are almost the same ranging from -0.25 to -0.39; however, (ii) the income elasticities for the number of beneficiaries in both groups (2.17 for children and 2.32 for adults) are much higher than those for per capita benefits (0.26 for children and 0.61 for adults). Hence, a state will decrease both the number of Medicaid eligibles and benefits per capita by the same proportion in response to a "price increase" in the Medicaid commodity, but will allow only the number of beneficiaries to expand rapidly when a state's tax revenue increases.

For elderly recipients, the results indicated that (i) price elasticities for the number of recipients and per capita benefits of elderly recipients are almost the same (-0.43 and -0.47 respectively), and they are more elastic to a change in the price of Medicaid than for AFDC children and adults; in addition, (ii) while the income elasticities for the number of beneficiaries in AFDC children and adults are much higher than for per capita benefits, income elasticities for both the number of beneficiaries and per capita benefits in the elderly group are high; (iii) however, the income elasticity for the number of recipients is negative (-2.25), while that for per capita benefits is positive (2.42). This suggests that an increase in tax revenue in a state will increase the per capita benefits to the elderly, but will cut the number of elderly Medicaid recipients.

2-5. Experience of other OECD countries

Features of the long-term care system of other countries, in particular, the countries in the Organization for Economic Cooperation and Development (OECD), that might be applicable to the United States are important for improving long-term care policy. Like the United States, the OECD countries face the aging of the population and rising government expenditure on long-term care. For example, the projections of the US Bureau of the Census indicates that the percent of the total population consisting of persons aged 65 and over, which was 11.5% in Canada, 15.0% in Germany, 18.0% in Sweden, and 15.7% in the United Kingdom in 1990, will increase to 14.3%, 20.4%, 19.6%, and 17.1% by 2010, respectively[17]. These countries, which are experiencing dramatic demographic change, are struggling to seek ways to deliver long-term care more efficiently under their limited government budgets.

The various levels of government agencies (central, regional/state/provincial, and local governments) and the private sector share responsibilities for long-term care in most of the OECD countries, as in the United States. The countries can be classified into three types with respect to the sharing of responsibilities for medically related or institutional long-term care among the various levels of government and the private sector. (1) Australia, France, Japan, and the United Kingdom have highly centralized long-term care systems run by the central government. (2) Regional and local governments share responsibility for nursing home care with the central government in Canada, Netherlands and Sweden. (3) Germany and Switzerland offer unique perspectives because private insurance dominates their personal health care system. Systems for community-based care, also can be divided into three types. In

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[17] United States General Accounting Office, August 1994, "Long-Term Care: Other Countries Tighten Budgets While Seeking Better Access", GAO/HEHS-94-154, Washington, D.C.: p. 5, Figure 1.1 (Source: US Bureau of the Census, Center for International Research, International Data Base on Aging).

Australia and France, the central government shares responsibility for long-term care with regional and local governments. In the Canada, Japan, Switzerland, Sweden, and the United Kingdom, community-based care depends only on regional and local governments. In Germany and Netherlands, both the private and public sectors are involved in community-based long-term care[18].

These countries have established, or plan to establish, one or more of the following features[19]: (i) the decentralization and consolidation of responsibility for long-term care, that is, emphasis on the role of municipal (or local) government agencies rather than central government; (ii) eligibility based on functional rather than financial need;(iii) emphasis on community-based care rather than the more expensive institutional care, where appropriate; and (iv) support for family members and other informal caregivers through financial or other benefits. Other than these four features,

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[18] Tilly, J. and B. R. Stucki, December 1991, "International Perspectives on Long-Term Care Reform in the United States", American Association of Retired Persons (AARP), p. 10, Table 2.

[19] The report to the Special Committee on Aging, US Senate by the United States General Accounting Office shows examples of these arrangements. In regard to (i) the decentralization of responsibility for long term care, for example, in the United Kingdom, Sweden, and the provinces of British Columbia and Ontario in Canada, the intent is for a case manager (a team of health and social service professionals) to assess individuals' needs and obtain the appropriate mix of services that are available from various public and private organizations providing care. Germany's fragmentation of home and community long-term care among various private organizations has created uneven access to services across geographic areas. As for (ii) eligibility based on functional need, Sweden and certain Canadian provinces have traditionally provided long term care on the basis of functional need. In the United Kingdom, functional need is expected to be the local authority's first consideration in providing benefits, but officials are concerned that some form of means testing may be necessary after an initial functional needs assessment. Examples of *(iii) emphasis on home care* are provided by reforms in German and the United Kingdom which will endorse the use of community-based care. British Columbia has begun reallocating funds from its global budgets for physician and hospital services to expenditure for community services. Ontario aims to increase public spending on home care by 1997 from 20~30% of all long term care spending. Sweden, which already spends 35% of its long term care resources on home care, has recently expanded services in this areas, providing a wider variety of home nursing, personal care, adult day care, supportive housing, meal, and transportation services. Encouragement of informal caregiving is exemplified by Germany's reforms, which will enable individuals to receive cash benefits to pay family members and others for providing long term care services. Sweden also pays salaries to family members who give full-time or part-time care (Excerpt from United States General Accounting Office, August 1994, ibid., pp. 6-8).

I think that involving the private sector in the long-term care business, that is, establishing a mixed system of public and private insurance, is a potential direction for reform of the long-term care system. The United States has already established both the first and the third features in public policy relating to long-term care. The second and fourth characteristics are already being considered among professionals (e.g., the Brooking-ICF Long-Term Care Financing Model, which will be discussed in the following section).

In the United States, the decentralization of responsibility for long-term care has already been accomplished. Each state has the authority to determine who is covered, what services are available to recipients, and how providers are reimbursed for their services, under broad federal guidelines. Furthermore, the non-federal share of spending is substantial: out of total Medicaid expenditures on long-term care in 1993 ($131 billion), the share of the federal government is 57.3% ($75 billion) and the share of the state government is 42.7% ($56 billion).

Likewise, community-based care involving household members and other informal unpaid caregivers has been emphasized in the United States. However, financial support for these caregivers has not yet been a primary issue. As I discussed, home care may be less costly because it heavily depends on informal unpaid caregivers. But if one uses formal home care as a substitute for informal home care, community-based care is not necessarily less costly than institutional care. Involving informal caregivers as much as possible will help reduce nursing home use. But while considering informal caregivers as an important "capital stock" to produce elderly persons' time in the community, we also have to think not only about caregivers' opportunity costs but also about the physical and mental costs they incur when taking care of elderly persons. Therefore, emphasis on community-based care should be accompanied by financial and mental support for informal caregivers.

In Japan, however, there is a debate about introducing a system in which the government provides financial support to informal caregivers. Since most primary informal caregivers for the elderly in the community are females in Japan, providing financial support by the government to informal caregivers may discourage females' economic activities outside the household. Thus, when emphasizing community-based care and establishing a system to support informal caregivers, we have to consider the circumstances surrounding the elderly in different societies who need long-term care: as the family structure, the female labor participation, and the availability of formal homes.

In the United States, eligibility for now acute or long-term care under Medicare is based on functional rather than financial need, while Medicaid is a mean-tested program. Since Medicaid is the only significant government program to provide long- term care coverage for the elderly who do not meet the requirements for SNF coverage under Medicare, yet who become unable to function in the community, public policy on long-term care in the United States has been based on financial rather than functional need. The "Medicaid liberalization" proposed in the Brooking-ICF Long-Term Care Financing Model (Wiener et al. 1994) will make Medicaid program focus on functional need, because it includes an increase in the Medicaid financial eligibility standard and exclusion of the restriction on housing assets. I will discuss this model in the following section.

To examine these efforts for long-term care in other OECD countries in detail and to make a suggestions on the reform of the long-term care system in the United States are beyond this paper's scope. However, I think that, as a whole, the reform of the long-term care system in the United States is similar to the direction of the long-term care policy pursued by other OECD countries. It is very important for policy makers in the United States to observe other countries' efforts to expand access to a wide range of long-term care services under their restricted public budgets and evaluate the outcome of these countries' recent reforms.

2-6. Conclusion

A substantial number of debates have been conducted on public policy for long-term care for the elderly among not only politicians, lobbyists, and beneficiaries, but also medical and social scientists. The background of the current debates includes three issues: (i) the aging of the population in the United States; (ii) expenditures biased toward institutional care despite the elderly's preference for staying in the community; and (iii) the present catastrophic situation in both out-of-pocket health care costs and government spending on Medicaid, as discussed in the previous section. The discussants can be broadly classified into three groups: those who emphasize the primary responsibility of the public sector - the federal and state governments - for long-term care; those who think that elderly individuals and their families should have the responsibility for care; and the neutrals, who prefer that responsibilities for care be shared between public and private sectors. “The choice of emphasis between public and private programs depends not just on political ideology, but also on whether private and public initiatives are affordable, whom they would benefit, and whether they can reduce catastrophic costs and realign the delivery system” (Wiener et al. 1994).

Possible strategies for long-term care of the elderly are discussed by the Brooking-ICF Long-term Care Financing Model (Wiener et al. 1994). The authors suggest that the public sector should develop a mixed system of private insurance, Medicaid liberalization, and expansion of home care and “front-end” nursing home coverage under the social insurance program. Medicaid liberalization includes five reforms of current programs: (i) an increase in the Medicaid financial eligibility standard and removal of the restriction on housing assets; (ii) an increase in the personal needs allowance; (iii) expansion of home care for the severely disabled who have two or more ADL deficiencies or cognitive impairment; (iv) unlimited home care benefits with no cost-sharing for the severely disabled, and the same benefits for the less disabled as in the current program; (v) expansion of private insurance for both nursing home and home care. “Front-end” coverage is defined as a program that covers the first six months of a nursing home stay, at a twenty percent coinsurance rate.

According to their simulation model, public spending for long-term care will increase from $41.9 billion in 1993 to $87.5 billion in 2018 if the current public system for long-term care remains. However, if the alternative system recommended by the Brooking-ICF Long-term Care Financing Model were established, public expenditure would be $65.1 billion in 1993, increasing to $132 billion in 2018. Therefore, the incremental public cost is larger under the alternative system by $23.2 billion in 1993 and $44.5 billion in 2018, while the alternative system will reduce out-of-pocket costs for nursing home care by 34% in 1993 (from $28 billion under the current system to $18.5 billion under the alternative system) and 31% in 2018 (from $69.2 billion to $47.7 billion).

How do the elderly who need long-term care respond to the current public policy? For instance, how is the choice of an elderly person in the states where the Medicaid policy encourages the elderly to use institutional care compared to those where it emphasizes home care? Does the prescreening program act as an obstacle to future growth of nursing home admissions? Do the numbers of nursing home beds certified by Medicaid and the daily Medicaid reimbursement rates affect an individual's decision to enter a nursing home, under the current system? Since the Medicaid program is run by each state under broad federal guidelines, it differs from state to state. Study of the effects of the variation in Medicaid policies among states on individual choices in long-term care will help in planning long-term care reform. In this study, I undertake to answer these questions. Hopefully, this study will contribute to finding a future direction for long-term care reform in the United States.

3. Literature review

A substantial number of research studies have been conducted on long-term care for the elderly. In this section, I would like to introduce the previous studies on individuals' utilization of long-term care, or, the demand for long-term care.

The determinants of long-term care utilization examined by previous studies can be categorized into the following three groups: (i) demographic characteristics; (ii) disabilities and other health variables; and (iii) socioeconomic factors. Demographic characteristics include age, education, living arrangements, marital status, neighborhood characteristics (urban or rural), race, and sex. Disabilities and other health status items include chronic limitations in ADLs and IADLs, cognitive impairment, and acute health conditions. Socioeconomic factors consist of assets, housing, income, insurance status, including private and public insurance such as Medicaid, and state-specific policy variables. The combinations of these characteristics to be investigated are different among studies, depending on the aim of the study. Also, the prior studies used various data sources and methods to examine the utilization of long-term care.

First, I discuss theoretical issues of long-term care. Second, I summarize previous studies with respect to community-based and institutional services, and, finally, I indicate the contribution of this study.

3-1. Theory of demand for long-term care

A theory to explain the demand for long-term care of the elderly has not been well developed yet, although there are many empirical studies. Stylizing the theory of long-term care for the elderly is very challenging. First, long-term care consists of various kinds of paid and unpaid goods and services and it is affected not only by economics but also by demographic and health status factors. Second, since most elderly persons have been already retired from earning activities and do not have wages and working time, it is difficult to introduce time and budget constraints when modeling an elderly individual's utility maximization problem.

Nevertheless, economic theory tried to explain the demand for nursing home care in the framework of traditional demand theory in the 1980s (Chiswick 1976; Sloan et al. 1978; Scanlon 1978; Bishop 1979; Yett et al. 1980; Scanlon 1980; Palmer and Vogel 1983; and Dusansky 1989). "Demand for nursing home care is a basic demand, rather than a derived demand for health", because of the difference in characteristics of medical care services and long-term care (Scanlon 1980). First, nursing homes are "long-term substitutes for independent living" in the community to meet basic needs in daily life for most elderly residents. Therefore, second, in contrast to acute medical care, the utilization of nursing homes does not rely so much on the physician but depends on choices by an elderly individual, his or her family, or a social worker. Third, unlike other medical services where most physicians might benefit from the decisions that they influence, in most cases, the person making a choice about use of institutional care does not benefit financially from the decision.

Currently, manage cared in the long-term care sets limits on the physician's freedom to benefit from recommending a particular types of services.

Those who consider nursing home care as a standard economic good assume that an elderly person is likely to have sufficient information for decision-making for long-term care and also faces substantial out-of-pocket costs. Most nursing homes have two kinds of patients: private-pay and Medicaid. Indeed, much evidence shows that many private patients become Medicaid eligible as they spend down their assets to the requisite indigency levels (Palmer and Vogel 1983). Given the dual nature of the nursing home market, in which self-pay patients will respond to price change, and the public price (Medicaid reimbursement rate) is fixed, a nursing home faces two kinds of demand curve, each with a different elasticity. Hence, the demand for nursing home care including both types of patients is not just a straight downward sloping curve, but kinks at the fixed price set by the state government (Figure 1-2).

The combined demand curve of private plus Medicaid-pay patients is represented in Figure 1-2. The curves, D_P, D_{MD}, and D_{P+MD}, refer to the demand for private, Medicaid, and private plus Medicaid-pay patients, respectively. The state Medicaid program sets the reimbursement rate at R, which is the price of nursing home care faced by the Medicaid patients. The demand of private-pay patients is responsive to price (D_P), while that of Medicaid patients is infinitely elastic (D_{MD}) at the reimbursement rate, R. Each quantity of beds, OQ_A and Q_AQ_B, signifies the total number of beds available for private-pay patients and for Medicaid eligibles in a nursing home. The behavior of the supply side differs by type of sponsorship. A proprietary nursing home will try to distinguish private-pay patients from public pay clients to maximize profits and a non-profit facility will have other objectives. If spend-down occurs among many elderly persons, the number of Medicaid eligibles may increase in the short run. The state government will have to increase its Medicaid budget allocations, and/or reduce the reimbursement rate, and/or tighten the eligibility qualifications (Palmer and Vogel 1983).

The theory of demand for institutional care based on the traditional concept of a standard economic good, nonetheless, is not adequate as a theory of demand for overall long-term care in general. First, the assumption that an elderly person is likely to have sufficient information for decision-making for long-term care and can always be a decision-maker entering a nursing home is unrealistic[1]. Elderly persons who need facility care may be too physically and/or mentally disabled to decide which service is better for them. Indeed, the choice of long-term care might depend on family circumstances such as the number of potential caregivers, the housing environment, and family income, rather than on an elderly individual's decision. Second, the person making the choice about using facility care often involves informal caregivers such as the person's family and friends, one or more whom might benefits financially from institutionalization, if their opportunity cost is very high. Third, institutional care should be considered as a source of long-term care for which

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[1] Scanlon (1980) also noted that the choice of entering a nursing home is not always in the hands of potential residents. A large share of nursing home residents suffer from diminished mental capacity that precludes an informed choice. Therefore, actual decisions are left to the resident's family , a social worker, or a physician. Nevertheless, he treated nursing home care as a standard economic good on the ground that the decision-makers rarely benefit from the choice, unlike other medical services where the provider benefits.

both formal and informal community-based services are substitutes. When considering long-term care, we cannot ignore community-based care. Among elderly persons who require long-term care (7.33 million), in fact, 77.6% are living in the community and depend on community-based care (see section 1-2). For home care, in particular, this makes the demand for long-term care difficult to understand in the context of the traditional demand and supply for a standard economic good, because home care consists of non-market goods and services provided by family members. Therefore, fourth, the demand for nursing home care is influenced not only by the market prices of facility-based care and formal home care but also by the shadow price of informal home care. This shadow price may be determined by many factors, such as the number, education, health status, and opportunity costs, of potential givers of informal care.

An alternative approach is to treat home care and institutional care for the elderly the same as other medical care services. Under the hypothesis of the health production function (Grossman 1972a and 1972b), an elderly person's utilities with regard to "good health" and other consumption goods are assumed to be maximized subject to the health production function and income and time constraints. Each demand for institutional care and for formal and informal community-based care is considered as an input demand. These demands are derived from the demand for "good health" and other consumption goods and depend on relative input prices. In this theoretical framework, in addition to the influence of economic factors, both the demographic and the health status of an individual, which are theoretically difficult to be explained in the traditional demand and supply analysis of the nursing home market, play important roles. For example, an elderly person's demographic characteristics, such as marital status and living arrangements, are related to input prices of informal community-based care. Health status is relevant to demand because long-term care is explained as an investment required to mitigate the effects of health stock depreciation with an individual's acute and chronic conditions and age.

Some empirical studies have tried to demonstrate the demand for long-term care in this theoretical framework (Hanley and Wiener 1991; Kemper 1992; and Headen 1993). Input price effects on substitution of long-term care inputs of institutional care and formal and informal community-based care are discussed by Headen (1993). He states that each input demand is positively related to the own-price, and responsive to cross-price effects, whose direction depends on "the degree to which the inputs are complements or substitutes" in the health production function. Also, Kemper (1992) referred to the input price effect on substitution between formal and informal home care, stating that "a higher price of formal home care is expected to decrease use of formal care and increase use of informal care" and "greater availability of family is expected to lead to use of less formal care and more informal care". The availability of family is a proxy measure of the input price of informal care. For example, a greater number of potential caregivers and lower average opportunity costs of each potential caregiver's time might imply a lower input price of informal care. Kemper describes the income effect on community-based care as follows: “higher income is expected to lead to use of more formal care and - because higher income permits the “purchase” of more informal caregiver time for activities other than caregiving, such as paid work, home production, or leisure - use of less informal care” (Kemper 1992).

As Scanlon (1980) noted in discussing the characteristics of long-term care compared to more traditional medical care services, one key difference is that nursing homes are “long-term substitutes for independent living” in the community to meet basic needs in daily life and “in-home services are frequently purchased to maintain independence in the community, rather than to obtain a state of improved health” (Hanley and Wiener 1991). Regardless of the different attributes of medical and long-term care, they are alike, in that both demographic and health status, as well as economic factors would determine the demand for long-term care (Feldstein 1988). However, traditional demand and supply analysis of the nursing home market ignored two important factors which affect an elderly person’s choice of long-term care: (i) the effects of demographic and health status variables and (ii) the effects of the shadow price of long-term services other than facility care. Consequently, the hypothesis of the health production function can provide a more comprehensive framework for examining long-term care overall than the traditional demand and supply analysis which involved empirically demographic and health status variables, however cannot rationalize theoretically the needs for these indicators.

3-2. Community-based care

The papers written by Hanley and Wiener (1991) and Kemper (1992) provided admirable summaries of the literature for elderly persons' utilization of home care. This section heavily relies on these papers.

There are two kinds of community-based care for the elderly: formal (paid) and informal (unpaid). Nine previous studies on elderly persons' formal community-based care are reviewed below: Branch et al. 1981; Coulton and Frost 1982; McAuley and Arling 1984; Soldo 1985; Garber 1989; Liu et al. 1990; Williams et al. 1990; Hanley and Wiener 1991; and Kemper 1992. Also, I review seven studies on informal home care for elderly persons: Greene 1983; Stoller 1983; Moscovice et al. 1988; Garber 1989; Dwyer and Miller 1990; Edelman and Hughes 1990; and Kemper 1992. Three other surveys (Greene 1983; Moscovice et al. 1988; and Kemper 1992) address both formal and informal care, examining the substitution between them[2]. The results of these studies are summarized in Tables 1-8 and 1-9, covering formal and informal community-based care, respectively.

3-2-1. Formal community-based care

The nine studies selected for the literature survey used various data sources for information on formal care use. Three used national sample studies (Soldo 1983; Garber 1989; and Hanley and Wiener 1991); two used the samples from the baseline interview of the National Long-Term Care Channeling Demonstration (Liu et al. 1990

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[2] Garber (1989) also examined both formal and informal community-based care, but he did not consider substitution effects. Instead, he investigated the effects of an individual's socioeconomic, demographic, and health status characteristics on the number of days of each type of care, separately.

and Kemper 1992)[3]; and the other four used state or regional wide surveys. All the samples used by these studies consist of persons aged 65 and over, except for two statewide surveys in Virginia: (i) a survey of older Virginians in 1979 (McAuley and Arling 1984); and (ii) a study of the effect of diagnosis-related groups on home health services in Virginia in 1982-1985 (Williams et al. 1990). The former includes persons aged 75 and over, and the latter contains all age groups.

These nine studies also used different definitions of formal community-based care, and had different outcome variables. The chance of using any type of formal home care was estimated by two studies (Branch et al. 1981 and Soldo 1983); the number using different types of care, such as skilled nursing care, personal care, and homemaker services, was predicted by two studies (Coulton and Frost 1982; and McAuley and Arling 1984); the number of visits was used by two studies (William et al. 1990 and Hanley and Wiener 1991); the number of days or hours of care was measured by two studies (Garber 1989 and Kemper 1992); and the cost of formal home care was examined by one study (Liu et al. 1990).

The studies investigated the effects of demographic characteristics, including age, children, education, marital status, race, sex, and residence circumstances on the

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[3] The purpose of the National Long-Term Care Channeling Demonstration (NLTCCD) is to test whether public financing of home care would reduce long-term care costs by substituting care at home for care in nursing homes. The NLTCCD study sample is a targeted group from ten sites representing considerable geographic and socioeconomic diversity. The ten sites are Baltimore; Houston; Cleveland; Miami; Philadelphia; an eight-county region in Eastern Kentucky; a two-county region in southern Maine; Middlesex County in New Jersey; Rensselaer County in New York; and Greater Lynn in Massachusetts). The NLTCCD enrolled persons are substantially impaired in functional capacity and have some degree of unmet need in an important functional area. Applebaum (1988) estimates that about 5% of the elderly population would meet the Channeling eligibility criteria.

utilization of formal community-based care. None of these characteristics were found to affect significantly formal home care utilization in the majority of studies.

Eight studies included age (the exception was Soldo (1983)). Age has a significantly positive effect on paid home care use in half of the studies that included it (Coulton and Frost 1982; Liu et al. 1990; Hanley and Wiener 1991; and Kemper 1992).

Whether an elderly person has any children or is married is a indicator of that elderly person's use of informal community-based care. The number of children appeared in three studies (Garber 1989; Hanley and Wiener 1991; and Kemper 1992), and all found a significantly negative effect on formal home care utilization, except for one study (Garber 1989) which found a significantly positive effect. Six studies examined marital status, and three of them found that that being not married increases formal care use (Soldo 1983; Hanley and Wiener 1991; and Kemper 1992).

Education was included "both as a measure of unreported wealth and to identify consumers better able to negotiate the fragmented formal care delivery system" (Hanley and Wiener 1991). Five studies included education in the regression, but only two found education to increase use of formal care significantly (McAuley and Arling 1984; and Kemper 1992).

Race was examined by seven out of the nine studies, but only one found being white to have a significant positive effect on formal care use (Kemper 1992). Similarly, all the studies included sex, but only two, both based on the NLTCCD (Liu et al. 1990 and Kemper 1992), found that being female was a significant predictor.

Urban residence is a measure of more access to paid home care. Two out of four studies using the variable found it to be significant (Soldo 1983; and McAuley and Arling 1984). The results show that living in a large city increases formal home care utilization of the elderly.

The availability and utilization of informal care are very important demographic determinants of formal care use because informal community-based care might substitute for formal care. Employment of an elderly person's use of informal care as an explanatory variable, however, will cause the statistical problem of endogeneity, "because the provision of informal care and the decision to use formal care may be simultaneously determined"[4] (Hanley and Wiener 1991). Greene (1983), Moscovice et al. (1988), and Kemper (1989), all of whom examined substitution between formal and informal community-based care, also discussed this issue. Including endogenous variables in an ordinary least squares (OLS) regression will produce a biased and inconsistent result. In order to reduce the bias, a multiple regression such as a two- or three- stage least squares (2SLS or 3SLS) procedure can be used (Greene 1983; Moscovice et al. 1988; Dwyer and Miller 1990; and Edelman and Hughes 1990). One other of the selected studies (Hanley et al. 1991) tested the hypothesis that unpaid caregivers provide less care as formal care increases, using a 2SLS procedure. If these procedures are not used, an elderly person's living

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[4] "The disabled and their families may make choices about satisfying home care needs based on the amount of informal care the family is able to provide, the living situation of the disabled person, and the amount of formal care they can access. It is impossible to disentangle with certainty whether the amount of informal care available influenced formal care use, or whether the availability of formal care services influenced the amount of informal care being received" (Excerpt from Hanley, R.J. and J.M. Wiener, September 1991, "Use of Paid Home Care by the Chronically Disabled elderly", Research on Aging, Vol. 13, No. 3, pp. 310-332).

arrangement and marital status are better indicators of informal care use than the availability and utilization of informal care, because the former are exogenously predetermined before an elderly person becomes physically and mentally impaired.

The poorer health stock an elderly person has, the greater the demand for long-term care. These studies investigated the effect of health status variables on the utilization of formal community-based care, using limitations in ADLs and IADLs, cognitive impairment, and acute medical care, which the studies identify as recent use of a hospital and/or doctor. Among these variables, the limitations in ADLs are the most consistent predictors of formal home care use. Eight studies (the exception being Williams et al. (1990)) included it. All studies found a significant result in that those who have limitations in ADLs are more likely to use paid home care (Branch et al. 1981; Coulton and Frost 1982; McAuley and Arling 1984; Soldo 1985; Garber 1989; Liu et al. 1990; Hanley and Wiener 1991; and Kemper 1992). Four out of the nine studies examined the effect of limitations in IADLs, but only one found a significant negative effect on formal home care use (McAuley and Arling 1984). The direction of the effect suggests that those who have more IADL problems are less likely to use paid home care than those with fewer IADL limitations. This result is inconsistent with the expectation that an elderly person who has less health stock is more likely to use long-term care services. Soldo (1983) concluded that IADLs are no longer a significant determinant of formal home care utilization.

Cognitive impairment was included in all but two studies (Branch et al. (1981) and Garber (1989) were the exceptions). Measurement of cognitive function, however, differed among studies. Three studies based on the NLTCCD and the National Long-Term Care Survey (NLTCS) used the Short Portable Mental Health Questionnaire (SPMHQ) and behavioral problems (Liu et al. 1989; Hanley and Wiener 1991; and Kemper 1992); two studies used a 6-point "mental health" scale (McAuley and Arling 1984; and Coulton and Frost 1982); Soldo (1983) used the need for supervision; and Williams et al. (1990) used health diagnostic information. Four out of the seven studies found a significant result: two found that cognitive impairment increases use of paid home care by the elderly (Soldo 1983; and Hanley and Wiener 1991); and two studies tested more than one independent variable for impaired cognition, at least one of which led to an increase and at least one, to a decrease in formal care use (Liu et al. 1990 and Kemper 1992).

Either a doctor visit or hospitalization serves as a measure of acute medical care use in four studies (Branch et al. 1981; McAuley and Arling 1984; Williams et al. 1990; and Kemper 1992), but it has a significant positive effect on paid home care use only in two studies (Branch et al. 1981 and Kemper 1992).

Economic factors such as assets, income, and insurance coverage are expected to increase an elderly person's ability to afford formal home care and to raise the demand for paid home care. Four studies examined the effect of assets, of which two found a significant positive influence on formal home care utilization (Garber 1989; and Liu et al. 1989). All studies but Williams et al. (1990) included an income variable, but only four found a significant effect on utilization of paid home care. Three studies found a result consistent with the projection that those who have more income are more likely to use paid home care (Branch et al. 1981; Liu et al. 1989; and Kemper 1992), but one study, which is based on household income rather than an elderly individual's income, found an opposite result (Soldo 1983). The larger the household's income, the less the use of formal home care. One possible explanation for this result is that an elderly person and his or her family might be more likely to choose facility care rather than paid community-based care if the family have enough financial resources to afford nursing home care and if an elderly person is seriously enough disabled to require paid care.

Either having private insurance coverage or receiving Medicaid can be expected to lead to more demand for formal community-based care (moral hazard). Seven studies used a Medicaid eligibility variable, but only two studies found a significant effect (Hanley and Wiener 1991; and Kemper 1992). The finding of Hanley and Wiener (1991) shows the presence of moral hazard in the market for formal community-based care in that Medicaid beneficiaries are more likely to use paid home care, while Kemper found an opposite result; namely, that those with Medicaid used 1.6 hours per week less paid home care than those without Medicaid. Since Medicaid is a means-tested program, eligibility is a measure of an individual's poverty. Therefore, one possible explanation of Kemper's result is that the poor are more likely to use informal sources of care, such as family members and friends, rather than formal care, because the poor may not have enough financial resources to obtain formal home care services, or because they may not be educated enough to access to information about public support for formal home care. Two studies used a private insurance variable, but they could not find a significant effect on formal care utilization (Branch et al. 1981 and Soldo 1983). Indeed, few private insurance plans provide substantial home care benefits.

3-2-2. Informal community-based care

This second section reviews the seven studies on informal community-based care (see Table 1-9). Various data sources were used by these studies. Two used a national sample, the NLTCS (Garber 1989 and Dwyer and Miller 1990); one used the samples from the baseline interview of the NLTCCD (Kemper 1992); and the other four used state or regionwide surveys. All the samples used by these studies consist of persons aged 65 and over, except for the regionwide survey of the Community Services System (CSS) client care program in 1980 in the Tucson, Arizona, metropolitan area (Pima County), which includes persons aged 60 and over (Greene 1983).

The seven studies also used different definitions of informal community-based care. The number of days or hours of care was measured by five studies (Stoller 1983; Moscovice et al. 1988; Garber 1989; Dwyer and Miller 1990; and Kemper 1992); and the utilization of different types of care was predicted by two studies (Greene 1983; and Edelman and Hughes 1990). Stoller (1983) estimated the number of hours of informal care provided by sons and daughters, separately. Dwyer and Miller (1990) predicted stress and burden felt by caregivers, as well as hours of care.

Like studies on formal home care, these studies analyzed the effects of an elderly person's demographic characteristics, health status, and socio-economic characteristics on informal care use. In addition, caregivers' characteristics with regard to these three factors were examined as independent variables by some of the seven studies. A primary caregiver's age, number of children, marital status, sex, health status, income and employment status will affect the amount of informal home care supplied. The caregiver's number of children and marital status may be a predictor of the family's capability of giving informal care to the elderly. The more potential caregivers there are, the more the accessibility of informal care for elderly persons. However, larger families also can predict reduced a capability. For example, the caregiver's being married reduced hours of informal home care because "the time demands associated with the marital relationship and the importance attached to these responsibilities impede the ability of the adult child to help his or her parent" (Stoller 1983). A helper's health status can be also considered as a measure of the availability of family caregivers. Income and employment status of a primary caregiver can be regarded as measures of opportunity costs of caregiving time. Therefore, the helper's higher income and being employed might reduce the flow of unpaid home care for the elderly because of higher opportunity costs.

None of the demographic characteristics were found to affect significantly the utilization of informal home care in most of the studies. Five studies included an age variable, but only two found a significant coefficient (Stoller 1983 and Garber 1989). While Stoller (1983) found a positive effect of age on hours of care provided by his or her daughters rather than sons, Garber (1989) found a negative influence of age on the number of days of care in a recent week but the size of the effect is very small.

Whether an elderly person has any children or is married is a indicator of the availability of the family caregivers. Greater availability is expected to lead to use of less formal care and more informal care (Kemper 1992). The number of children appeared in two studies (Garber 1989 and Kemper 1992), both of which found a significantly positive effect on informal home care utilization. Three studies examined marital status (Stoller 1983; Edelman and Hughes 1990; and Kemper 1992). Stoller (1983) found that being not married has a negative effect on daughters' time for caregiving but not sons'; Edelman and Hughes (1990) discovered that being married has a positive effect on the number using various informal services; and Kemper (1992) obtained the result that for both married and not married persons, having a child has a positive effect, however, being married without a child reduce hours of informal care per week.

Three studies included education in the regression, but none found significant results (Garber 1989; Edelman and Hughes 1990; and Kemper 1992).

The utilization of formal care was used as a independent variable in four studies, and two studies found it to have a significant negative effect on informal care use (Greene 1982; and Edelman and Hughes 1990). The results show the substitutability of formal care for informal care. In order to avoid biased results from OLS regressions, these four studies employed multiple regression procedures such as 2SLS or 3SLS. Formal and informal community-based services, however, can be either substitutes or complements. Those who need more formal care may also utilize more informal care. However, no evidence of substitution between formal and informal home care was found in a study using a 2SLS procedure (Hanley et al. 1991). Instead, the result suggested that informal caregivers significantly increased the amount of care they provided for the most severely disabled who are cognitively impaired or who have three or more limitations in ADLs when formal care was received.

Race, sex, and urban residence are less emphasized in the studies on informal home care than in studies on formal care. Race was examined by three out of the seven studies, but only one found being white to have a significant positive effect on informal care use (Kemper 1992). Similarly, three studies included sex, but only once was being male found to be a significant positive predictor of the utilization of informal care (Moscovice et al. 1988). One study included an urban variable, without obtaining a significant result (Kemper 1992).

In addition, two studies included a primary caregiver's demographic characteristics, such as age, the number of children, marital status, and sex (Stoller 1983 and Moscovice et al. 1988). Moscovice et al. (1988) could not find any significant results for these variables, while Stoller (1983) found significant effects of the helper's number of children and marital status on informal care utilization. The number of children in the household, regardless of their ages, did not have a significant effect on the number of hours of help provided by daughters. However, the number of children under 6 within the household was positively related to the hours of assistance provided by sons. This result suggests that the sons assume caregiving responsibilities for their parents only when daughters and daughters-in-law are most heavily involved in early child care (Stoller 1983).

Fewer studies on informal care used disability and health status variables than formal care studies, but most found significant results for the health characteristics they included. Six studies included limitations in ADLs, of which five found a significant effect: those who have limitations in ADLs were more likely to use unpaid home care (Greene 1983; Stoller 1983; Moscovice et al. 1988; Dwyer and Miller 1990; and Kemper 1992). Three studies examined the influence of limitations in IADLs, and two found a significant positive effect on informal care (Moscovice et al. 1988; and Dwyer and Miller 1990) [5].

Cognitive impairment was included in three studies, and all found that it has a significant positive effect on informal care use (Greene 1983; Moscovice et al. 1988; and Kemper 1992). Measurement of cognitive function, however, differed among studies. Greene (1983) used nine measures for impairment levels of psychological and social functioning, such as levels of anxiety, depression, hostility, cognitive disturbance, and psychotic, regressive, or antisocial tendencies. Moscovice et al. (1988) used the binary variables, minor partial/ intermittent disorientation and total disorientation. Kemper (1992) used the Short Portable Mental Health Questionnaire

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[5] In the study by Moscovice et al. (1988), however, only the limitation in eating has a significant positive effect, among five limitations in ADLs (dressing; eating; bathing; incontinence; and transferring) to be examined. Also, the same study found only the limitations in taking medicine is significant, among three limitations in IADLs (telephone call; taking medicine; and preparing meals).

(SPMHQ) and behavioral problems. All studies found that cognitive impairment increases use of informal care by the elderly.

Either a doctor visit or hospitalization is used as a measure of acute medical care use in two studies; both found a significant positive effect on informal home care use (Garber 1989 and Kemper 1992). The more the use of acute medical care, the more the demand for informal home care. Garber (1989), using both previous doctor visits and hospitalization in the regression, found that previous hospitalization is positively related to the number of days of unpaid home care, but doctor visits are negatively related to it. This suggests that an individual who had supplementary insurance for physician care received fewer days of informal care (Garber 1989). The caregiver's health status was examined by Moscovice et al. (1988), but it was not found to be significant.

Use of socio-economic characteristics as independent variables in studies of informal care was less common than in studies of formal care. No studies include an assets variable. Income and Medicaid were included in two studies (Garber 1989 and Kemper 1992). Kemper (1992) did not obtain significant results, while Garber (1989) found that both income and Medicaid have a significant negative effect on informal care. However, Kemper (1992) found that the presence of a state Medicaid program for home care decreases the utilization of informal care. This result suggests that an elderly person who has higher income or who receives Medicaid is less likely to use informal care. The higher income and Medicaid might be a measure of greater access to both paid community-based and institutional care. The effect of the helper's economic characteristics were examined by Moscovice et al. (1988) and Stoller (1983). The former, using income of the helper, did not find a significant effect on unpaid care use. Stoller (1983), who examined employment status, found that it significantly reduces hours of informal care provided by sons. For sons, employment reduces the level of assistance by an average of 22.9 hours per month; for daughters, however, the coefficient is not significant.

3-3. Institutional care

The nine studies on elderly persons' institutional care are reviewed in this section: Greene and Ondrich 1990; Hanley et al. 1990; Liu et al. 1991; Garber and MaCurdy 1992; Headen 1993; Greene et al. 1993; Cutler and Sheiner 1993; Ettner 1993; and Boaz and Muller 1994. The results of these studies are summarized in Tables 1-10.

Three studies employed the NLTCCD (Greene and Ondrich 1990; Garber and MaCurdy 1992; and Greene et al. 1993); and the other six used, the NLTCS (Hanley et al. 1990; Liu et al. 1991; Headen 1993; Cutler and Sheiner 1993; Ettner 1993; and Boaz and Muller 1994). Both the NLTCCD and the NLTCS use samples consisting of those aged 65 and over.

Definitions of institutional care varied. The chance of entering a nursing home was estimated by four studies (Greene and Ondrich 1990; Hanley et al. 1990; Garber and MaCurdy 1992; and Cutler and Sheiner 1993); the length of stay in a nursing home was predicted by four studies (Liu et al. 1991; Headen 1993; Green et al. 1993; and Boaz and Muller 1994)[6]; and the chance of a person on a waiting list for institutional care was used by one study (Ettner 1993).

The influences of an individual's demographic characteristics on utilization of institutional care has stronger than for community-based care. All studies include an age variable; and age has a significantly positive effect on the elderly's institutional care use in all, except for two studies (Garber and MaCurdy 1992; and Ettner 1993).

The elderly's number of children and marital status is a measure of availability of informal community-based care. The results suggest that the number of children has a more significant effect on facility care utilization than does marital status. Elderly persons, in particular, females, may face a high probability of losing their spouses, since female elderly have a longer life expectancy at age 65 and over than males. Therefore, own children may be more important as a source of informal community-based care than own spouse. The number of children appeared in six studies, five of which found a significant negative effect: the elderly who have more children are less likely to use institutional care (Garber and MaCurdy 1992; Headen 1993; Greene et al. 1993; Cutler and Sheiner 1993; and Boaz and Muller 1994). Six studies used marital status as a independent variable, but only two studies found a significant effect (Garber and MaCurdy 1992; and Headen 1993). Garber and MaCurdy (1992) found that being married reduces an individual's probability of entering a nursing home, while Headen (1993) discovered that being not married increases it. Whether an elderly person is living alone was used by five studies as a

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[6] Although Liu et al. (1991) and Headen (1993) used the length of stay in a nursing home as a dependent variable, they estimated the transition probability from the community to a nursing home.

measure of less availability of informal care. This significantly increases the probability of using institutional care in four studies (Greene and Ondrich 1990; Hanley et al. 1990; Liu et al. 1991; and Boaz and Muller 1994).

The availability of formal community-based care and availability of informal care are important determinants of the utilization of institutional care, because they may be substitutes or complements for institutional care. Use of formal care is a more significant predictor of nursing home care than informal home care. Three out of four studies which included formal home care use found that those who use more formal care are more likely to enter a nursing home (Hanley et al. 1990; Liu et al. 1991; and Boaz and Muller 1994). Only one of the three studies which include informal home care use discovered a significant positive effect on the utilization of facility care (Liu et al. 1991). These results suggested that institutional and both formal and informal community-based care are complementary rather than substitute goods. Including both informal care use and demographic characteristics such as the number of children, marital status, and living arrangements as independent variables, however, will cause multicollinearity problems. These demographic factors are significant indicators of the capability of the family to provide informal care for the elderly. Three studies used both informal care use and the demographic variables, which are measures of the utilization of informal care, but the results may be biased and inconsistent because of multicollinearity (Greene and Ondrich 1990; Hanley et al. 1990; and Liu et al. 1991).

Educational attainment is taken "to reflect a more sophisticated and flexible view of an elderly person's social and health care needs" (Greene and Ondrich 1990). Education may indicate not only the level of an individual's economic resources, such as income and wealth, but also one's capability to make an appropriate choice in relation to long-term care. Two studies used educational attainment as a independent variable, but neither found a significant effect on nursing home use (Greene and Ondrich 1990; and Garber and MaCurdy 1992).

Race was examined by all the studies expect for Ettner (1993). Seven studies found race to be significant: in four of them, being white increases the probability of nursing home use (Hanley et al. 1990; Liu et al. 1991; Headen 1993; and Cutler and Sheiner 1993); and in three studies, being non-while reduces it (Greene and Ondrich 1990; Garber and MaCurdy 1992; and Boaz and Muller 1994). The results suggests that whites are more likely to use nursing home care, because "non-whites may be discriminated against in gaining admission to nursing homes, or, alternatively, may have a stronger informal support system than do whites" (Hanley et al. 1990). Alternative explanations are that whites tend to have more economic resources to spend on nursing home care than do non-whites, or, that white persons are more likely to survive longer because they have better access to health care, so that whites may be placed in facilities far more often than non-whites because they survive with disabilities.

Hing (1987) estimated that approximately 75% of nursing home patients are females. Because of females' longer life expectancy that results in a high probability of losing their spouse as potential caregivers, it is expected that female elderly persons are more likely to use institutional care. Sex was examined by all studies other than Ettner (1993), but only three obtained a significant result (Liu et al. 1991; Garber and MaCurdy 1992; and Headen 1993). The results are opposite to the expectation that elderly females face a higher probability of entering a nursing home than elderly males. Garber and MaCurdy (1992) and Headen (1993) found that being male increases the utilization of facility care and Liu et al. (1991) found that being female reduces it. The possible explanations are that female elderly are more likely to survive longer and so they may be healthier than males, or that females can be more independent with respect to managing daily life such as preparing meals, laundering, or cleaning a house, than males, even if they lost their spouse and live alone.

Among indicators of health status, ADLs problems are the most consistent indicator of institutional care, as they are for community-based care. All studies but Greene et al. (1993) examined the effect of limitations in ADLs on institutional care use, and seven of them found that those with such limitations are more likely to use facility care (Greene and Ondrich 1990; Hanley et al. 1990; Liu et al. 1991; Garber and MaCurdy 1992; Headen 1993; Cutler and Sheiner 1993; and Boaz and Muller 1994). The effect of limitations in IADLs on the utilization of institutional care is much stronger than its effect on paid community-based care. Three of the four studies that examined the effect of limitations in IADLs on facility care utilization found that it is significant (Greene and Ondrich 1990; Cutler and Sheiner 1993; and Ettner 1993). Greene and Ondrich (1990) and Cutler and Sheiner (1993) found that persons with more IADL needs are more likely to use facility care. Ettner (1993) discovered that persons with more IADL needs were less likely to be on the waiting list for institutional care, because they attempted to enter the nursing home sooner than healthier persons did.

Cognitive function was included in all but two studies, Cutler and Sheiner (1993) and Ettner (1993). The SPMHQ is used in all studies as a measure of cognitive impairment. Five studies found a significant positive effect of cognitive impairment on nursing home care use (Greene and Ondrich 1990; Hanley et al. 1990; Liu et al. 1991; Headen 1993; and Boaz and Muller 1994).

Previous nursing home utilization, which was included as a independent variable in four studies, was found in three of them to increase the probability of entering a nursing home (Hanley et al. 1990; Liu et al. 1991; and Headen 1993).

The definition of acute medical care use differed among four studies which included it. Hanley et al. (1990) used prior hospitalization; Liu et al. (1991) and Headen (1993) employed an individual's health condition needing acute medical treatment, such as (i) cancer, bone fracture, or stroke; (ii) pneumonia, bronchitis, emphysema, or asthma; and (iii) multiple sclerosis, cerebral palsy, epilepsy, or Parkinson's disorder; and Cutler and Sheiner (1993) used both prior hospitalization and presence of an acute health condition. All studies found that acute health conditions increase the probability of using institutional care.

Six studies included state-specific policy variables, such as the number of nursing home beds, the state Medicaid program, and the out-of-pocket price of nursing home care (Greene and Ondrich 1990; Liu et al. 1991; Headen 1993; Greene et al. 1993; Cutler and Sheiner 1993; and Ettner 1993).

Assets were included in two studies; only Hanley et al. (1990) found an effect the elderly with higher assets (defined as interest and dividend income equal to or greater than the sample median) are more likely to enter a nursing home, compared with those with assets below the median.

An income variable was included in seven studies, but only two found a significant effect on nursing home use (Liu et al. 1991 and Headen 1993). Liu et al. (1991) categorized the elderly into three groups by the level of income per month: (i) between $500 and $1,000; (ii) between $1,000 and $1,500; and (iii) more than $1,500. Only the coefficient of the lowest income group is significant, indicating that the elderly in that group are more likely to use nursing home care. Headen (1993), however, used three sources of income: private pensions; dividends; and rental income. The effects of private pension and rental income on facility care use are significantly negative: having these types of income reduces the probability of entering a nursing home. While the elderly person with high income tends to use more paid community-based care, both unpaid home care and nursing home care are apt to be utilized by the poorer. This result suggested that elderly persons who can afford home care prefer to stay in the community, but those with lower incomes attempt to use either informal care provided by unpaid caregivers or nursing home care, using government financial support such as Medicare and Medicaid and in-kind income or donations from friends and volunteer groups.

Home ownership was included in seven studies (the exceptions were Ettner (1993) and Boaz and Muller (1995)), six of which found a significant negative effect on nursing home use (Greene and Ondrich 1990; Hanley et al. 1990; Liu et al. 1991; Garber and MaCurdy 1992; Headen 1993; and Cutler and Sheiner 1993). The elderly who own their home are less likely to use nursing home care. Since the elderly who own a home do not meet the requirements of Medicaid eligibility, most of them have to complete "spend-down" before they become eligible if they utilize nursing home care. Also, an elderly person who is a homeowner may prepare room for live-in caregivers and the home may be adapted to ADL limitations.

Either having private insurance or receiving Medicaid increases the probability of entering a nursing home, in the studies which found the effect of such coverage to be significant. Two out of four studies which included a Medicaid variable found it to be significantly positive (Garber and MaCurdy 1992; and Ettner 1993). These two results represent completely opposite ideas. Garber and MaCurdy (1992) found that those who receive Medicaid are more likely to use institutional care. However, Ettner (1993) discovered not only that Medicaid patients are more likely to be on a waiting list for nursing home care, but also that they face greater access barriers to institutional care than non-Medicaid patients in areas where the nursing bed supply is constrained. Therefore, these results are not consistent enough to prove the presence of moral hazard among Medicaid patients in the long-term care market. Only one of two studies which included a private insurance variable found it to be significantly positive (Garber and MaCurdy 1992).

State-specific policy variables, including the number of nursing home beds, the presence of a Medicaid program for community-based care and a medically needy program, the Medicaid reimbursement rate and the difference between this rate and the private price, are examined by six studies. Bed supply was included in four studies, all of which found a significant effect on nursing home care use (Greene and Ondrich 1990; Liu et al. 1991; Greene et al. 1993; and Ettner 1993). The findings of three studies indicates that elderly persons living in states which have more nursing home beds are more likely to use institutional care (Greene and Ondrich 1990; Liu et al. 1991; and Greene et al. 1993). Ettner (1993) examined the interaction variable of Medicaid and bed supply, and found that people living in the areas in which bed supply is greater were less likely to be on the waiting list, suggesting that waiting periods were not as long.

The presence of a Medicaid program for home care and a medically needy program were used by Cutler and Sheiner (1993). They found that elderly persons living in states with a medically needy program are more likely to use facility care, but Medicaid coverage for home care did not have a significant effect.

Two studies included the influence of various Medicaid reimbursement rates (Liu et al. 1991; and Cutler and Sheiner 1993), but the latter employed the difference between the Medicaid reimbursement rate and the out-of-pocket price, rather than the Medicaid reimbursement rate itself. Liu et al. (1991) found that a higher Medicaid reimbursement rate reduces the demand for nursing home care. However, the finding of Cutler and Sheiner (1993) suggests that a smaller difference between the Medicaid reimbursement rate and the out-of-pocket price increases the demand for nursing home care. Although these results seem to be contradictory, both might be true for two different kinds of patients. Dusansky (1989) showed theoretically and empirically that a higher Medicaid reimbursement rate for nursing homes will be associated with more private patients, and so with a greater number of private patients and fewer public patients. Therefore, a decrease in the demand of public patients for nursing home care caused by the higher reimbursement rate may account for the finding of Liu et al. (1991) and an increase in the demand of private patients for facility care associated with the higher Medicaid compensation rate may explain the finding of Cutler and Sheiner (1993).

The effect of out-of-pocket price on facility care was examined by Headen (1993), who found that a higher private price reduces the probability of entering a nursing home. Headen (1993) also predicted that the price elasticity of the probability of nursing home entry is -0.7, which means that a 50% reduction in the out-of-pocket price of nursing home services would increase the likelihood of entry by 35%[7].

Finally, Liu et al. (1991) included a dummy for whether a state has two kinds of preadmission screening [PAS] programs, for "immediate" and "expected" Medicaid eligibles. They found that the presence of a PAS program for "immediate Medicaid eligibles", who have already been Medicaid eligible or who would be eligible immediately on the nursing home admission, increases the likelihood of nursing home entry.

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[7] The Headen's finding on the elasticity of a nursing home price for private patients is inelastic, compared with the price elasticities, -2.3 and -1.12, predicted by Chiswick (1976) and Scanlon (1980), respectively.

3-4. Conclusion

A substantial number of empirical research studies were conducted on the demand for long-term care of the elderly, yet a theory has not been well developed. The demand for long-term care of the elderly has attributes of both traditional and derived demand. First, long-term care is produced by various paid and unpaid sources. Second, decision-making might depend on not only an elderly individual but also health personnel such as physicians and nurses, the client's family, or a social worker. Third, unlike medical care services, long-term care is mainly purchased to meet an elderly person's basic needs in daily life, or to maintain a stable health condition, rather than to obtain "improved health". The traditional demand theory can well explain the demand of the elderly for institutional care, while the health production function might provide more comprehensive framework to examine overall long-term care for the elderly including community-based care, which is ignored by the traditional theory.

In this study, I will investigate the characteristics of elderly persons who are more likely to use facility care. Nursing home care is thought of as a source to produce long-term care goods, other sources being formal and informal community-based care. Therefore, the demand for institutional care will be considered as an input demand derived from the demand for stable health status and other consumption commodities which depends on relative input prices. The main task of this paper is to examine the influence of both an elderly person's health stock and the variation in Medicaid policies among states on an elderly person's likelihood of nursing home entry and discharge and on his or her hazard of mortality (either in the community or in a nursing home). The state's Medicaid policies will affect an individual's long-term care use through the input prices of long-term care services in the derived demand function.

Among studies on the elderly's institutional care use, Liu et al. (1991) and Cutler and Sheiner (1993) focused on the effects of various state Medicaid policies on the utilization of facility care. However, these two studies may be criticized for the following reasons. First, since they did not distinguish Medicaid patients and out-of-pocket patients, the effects of state Medicaid policies on nursing home care use by the elderly who are on Medicaid might not be estimated correctly. Nursing home care use by Medicaid recipients, but not by private patients, should depend on state Medicaid policies such as the reimbursement rate and the number of certified beds. Second, the finding of Liu et al. (1991) on state Medicaid program may be biased, because using both a Medicaid dummy for whether an individual is on Medicaid and a dummy for a preadmission screening program [PAS] in the same regression will cause an endogeneity problem. The presence of PAS will help determine the probability that a person is on Medicaid. Third, Liu et al. (1991) excluded state Medicaid policies from the equation to estimate the likelihood of mortality either in the community or in a nursing home. But the Medicaid policies are still relevant to the likelihood of death because they will influence people's health status. Fourth, Cutler and Sheiner (1993) did not find a significant effect of a dummy for whether a state provides Medicaid benefits for community-based care on nursing home care use, while I show that an emphasis on home care will reduce an individual risk of institutional care.

First, I analyze an elderly person's utilization of institutional care in a competing risks approach. Secondly, I extend the regression form to a model with time-varying covariates, which allows independent variables to vary over time; an econometric approach that has not been used among studies on long-term care utilization. Controlling for time-varying covariates, however, is important for exploring how (i) changes in state Medicaid policies; (ii) an increase in the depreciation rate of an elderly person's health stock; (iii) losing a source of informal caregiving, e.g., a spouse and friends; and (iv) a decrease in economic resources will affect an individual's choice of long-term care services.

Chapter 2

Theory and Econometric Model

1. Theoretical considerations

In this section, I investigate the determinants of elderly persons' nursing home care use, applying the framework of a health production function. The demand for institutional care is considered as an input demand which is derived from the demand for a stable health status and other consumption commodities. As stated in the previous section, however, unlike medical care, long-term care is mainly purchased to meet an elderly person's basic needs in daily life, or, to maintain a stable health condition, rather than to obtain "improved health". The levels of a stable health condition are different among individuals, since they depend on the health stock at the beginning of the survey period. The elderly will try to maintain (or improve if possible) their initial health status, using various long-term care services. Another characteristic that distinguishes long-term care from medical care is that the choice of long-term care will depend on family circumstances such as the number of potential caregivers, the housing environment, and family income. Therefore, the budget and time allocation not only of an elderly individual, but of household members as potential informal caregivers will affect a theoretical model of long-term care use.

Second, I discuss how state Medicaid policies will affect an individual's long-term care use by altering the input prices of long-term care services in the demand function. There are six characteristics of Medicaid program that differ among states that may affect nursing home utilization: (i) medically needy programs; (ii) Medicaid waivers for home and community-based services (HCBS); preadmission screening programs for both (iii) “immediate” and (iv) “expected” Medicaid eligibles; (v) the Medicaid reimbursement rate per day; and (vi) the supply of nursing home beds.

In the final section of this chapter, I develop the econometric specification of the model.

1-1. Demand for long-term care

Assume that the preference of an elderly person’s adult child as an informal caregiver depends on the aged person’s "stable health" (H) and other consumption goods (X); and the informal caregivers’ consumption goods (Y) and leisure time (T_L), which are characterized by the utility function $U = U(H, X, Y, T_L)$, and that this function is maximized subject to an elderly person’s health production function and the family budget and time constraints as follows:

max $U = U(H, X, Y, T_L)$ .... Eq. 1

subject to $H = H(C_N, C_F, C_I)$ .... Eq. 2

$X + Y + P_N C_N + P_F C_F = A + wT_W$ .... Eq. 3

$T = T_W + T_L + C_I$ .... Eq. 4

where the prices of consumption goods, P_X and P_Y, are assumed to be 1.

An elderly person's health production function is assumed to depend upon long-term care inputs, that is, nursing home care (C_N), formal community-based care (C_F) and informal home care (C_I): $H = H(C_N, C_F, C_I)$. The amounts of these services are presumed to be measured by time used. Here, C_I is the total amount of informal caregiving time for the elderly contributed by potential adult children in the family.

Since most elderly persons have already retired from earning activities[1], the payment for their long-term care is assumed to rely on an elderly person's non-labor income (A) and the earned income of other family members, wT_w, where w and T_w represent the family-level average wage rate and total working time of informal potential caregivers in labor market, respectively. If there are more than one potential caregivers in the family, the wage rates and working time differ among caregivers who have various amounts of human capital such as education and health status. Assuming that w_i and T_{wi} is the ith potential caregiver's wage rate and working time, a higher w_i is associated with larger human capital. Indeed, the total earned income from other family members must be expressed as $\sum_{i=1}^{n} w_iT_{wi}$, where n is the number of potential caregivers. In this case, the consumption goods purchased also differ among caregivers and thus, Y can be expressed as $\sum_{i=1}^{n} Y_i$. Therefore, given the total amount of informal caregiving (C_I), the higher the potential wage rate of caregivers in the labor market, the higher the opportunity costs of time for unpaid caregiving. Since information on neither each potential caregiver's wage rate and working time (w_i and T_{wi}) nor indicators for their human capital such as health status and education are not available, however, in order to simplify the theoretical framework, I assume w and T_w

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[1] Among sample persons in the National Long-Term Care Survey 1982-1984, which is used for estimation in this study, those who have income from earnings number 122 (2.7% of the total sample persons used for estimation).

to be the family-level average wage rate and total working time of informal potential caregivers in labor market and thus, $wT_W = \sum_{i=1}^{n} w_i T_{Wi}$. In Eq. 3, P_N and P_F specify the prices of nursing home care and formal community-based care.

The time constraint is expressed as the sum of all of the total available time for each potential caregiver, which can be described as the sum of working time, leisure time (T_L), and caregiving time (C_I). Again, if an elderly has more than one potential caregivers, Eq. 4 can be rewritten as:

$$\sum_{i=1}^{n} T_i = \sum_{i=1}^{n} (T_{Wi} + T_{Li} + C_{Ii}) \text{ .... Eq. 4'}$$

where $T = \sum_{i=1}^{n} T_i$, $T_W = \sum_{i=1}^{n} T_{Wi}$, $T_L = \sum_{i=1}^{n} T_{Li}$, $C_I = \sum_{i=1}^{n} C_{Ii}$. As an elderly person's income (A) is independent of time allocation between market and non-market activities, the time constraint is only applicable to adult child caregivers. Substituting the time constraint into the budget constraint, we can obtain:

$$X + Y + P_N C_N + P_F C_F + w\, C_I = A + w\,(T - T_L) \qquad \text{......... Eq. 5}$$

In Eq. 5, wC_I describes the total opportunity cost of informal caregiving time from all unpaid caregivers. The total cost of long-term care is shown by $P_N C_N + P_F C_F + wC_I$, and thus, the left side of Eq. 5 implies the total family's spending of on consumption goods and long-term care. The right side provides economic resources an elderly person could rely on, where $w\,(T - T_L)$ indicates total earned incomes of household members or other informal potential caregivers that would be if they do not spend any time for unpaid caregiving.

In order to solve the adult child's utility maximization problem, the Lagrangian multiplier method will be introduced as follow:

$$\max \quad L = U(H(C_N, C_F, C_I), X, Y, T_L) + \lambda [X + Y + P_N C_N + P_F C_F + w C_I - A - w (T - T_L)] \quad \text{...... Eq. 6}$$

The first-order conditions for a maximum are given by:

$$\partial L/\partial C_N = 0 = U_H H_N + \lambda P_N,$$

$$\partial L/\partial C_F = 0 = U_H H_F + \lambda P_F,$$

$$\partial L/\partial C_I = 0 = U_H H_I + \lambda w,$$

$$\partial L/\partial X = 0 = U_X + \lambda,$$

$$\partial L/\partial Y = 0 = U_Y + \lambda,$$

$$\partial L/\partial T_L = 0 = U_{TL} + \lambda w,$$

$$\partial L/\partial \lambda = 0 = X + Y + P_N C_N + P_F C_F + w C_I - A - w (T - T_L) \quad \text{.......... Eq. 7}$$

where U_H and U_X show marginal utilities with respect to H and X; H_N, H_F, and H_I are marginal products of health with respect to C_N, C_F, and C_I, respectively; and λ is the shadow price of the consumption goods. Solving these equations, the following conditions will be satisfied when the adult child's utility is maximized:

$$U_H/U_X = U_H/U_Y = P_N/H_N = P_F/H_F = w/H_I, \text{ and}$$

$$U_{TL}/U_Y = U_{TL}/U_X = w \quad (\text{since } U_X = U_Y) \quad \text{........ Eq. 8}$$

First, the marginal utility with respect to the aged person's consumption (U_X) equals the marginal utility as to the adult child's consumption goods (U_Y). Second, therefore, the ratio of the marginal utility with respect to the aged person's health (U_H) to the marginal utility as to the elderly's other consumption goods (U_X) equals the ratio of U_H to U_Y. Third, the ratio of the marginal utility with respect to the aged person's health to the marginal utility as to the elderly's other consumption goods equals the ratio of the price of each health input to the marginal health product with respect to each input. Fourth, the ratio of the marginal utility with respect to the adult child's leisure time (U_{TL}) to the marginal utility as to his or her other consumption goods (U_Y) equals the ratio of U_{TL} to U_X. Fifth, the ratio of the adult child's marginal utility with respect to his or her leisure time to consumption goods equals the family-level average wage rate (w).

Once the utility-maximizing problem is solved, the level of a stable health status for an individual elderly person which must satisfy the above condition will be obtained. Suppose that the optimal level of "stable health" is H* and that it is described as the function as follow:

$H^* = H^*(C_N, C_F, C_I)$ .... Eq. 9

and that the total costs of an elderly person's long-term care use can be defined as follow:

$H\pi = P_N C_N + P_F C_F + wC_I$ .... Eq. 10

where π indicates the shadow price of health. Under the optimal demand for "stable health", the demand for each type of long-term care input can be derived by minimizing the total cost function, Eq. 10. The Lagrangian is:

min $L = P_N C_N + P_F C_F + wC_I + \lambda\,[H^* - H^*(C_N, C_F, C_I)]$ .... Eq. 11

The first-order conditions for a minimum are given by:

$\partial L/\partial C_N = 0 = P_N - \lambda H^*_N$

$\partial L/\partial C_F = 0 = P_F - \lambda H^*_F$

$\partial L/\partial C_I = 0 = w - \lambda H^*_I$

$\partial L/\partial \lambda = 0 = H^* - H^*(C_N, C_F, C_I)$ .... Eq. 12

Solving these equations, the following three optimal conditions on relative prices are obtained:

$P_N/P_F = H^*_N/H^*_F$, $P_N/w = H^*_N/H^*_I$, $P_F/w = H^*_F/H^*_I$ .... Eq. 13

Substituting Eq. 13 into the optimal health production function, Eq. 9. the three conditional input demand functions under the optimal demand for a "stable health" (H*) can be derived as follows:

$C_N = C_N(P_N, P_F, w \mid H^*)$

$C_F = C_F(P_N, P_F, w \mid H^*)$

$C_I = C_I(P_N, P_F, w \mid H^*)$

$\partial C_N / \partial P_N < 0$, $\partial C_F / \partial P_F < 0$, and $\partial C_I / \partial w < 0$ .... Eq. 14

Now we have derived the demand for each type of long-term care input, which depends on both its own and relative input prices. An individual's choice of each long-term care input has been made to achieve the level of consumption that minimizes the cost of producing "stable health"(H*). In this study, I will focus on nursing home care (C_N). However, the empirical analysis in this thesis is not precisely identified with this demand function for C_N. Since I used average weekly wages in intermediate care facilities (ICFs) state by state as a proxy for the private-pay price (P_N)[2], and I do not have exact prices for formal and informal community-based care, I

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[2] Using the 1985 National Nursing Home Survey, I could obtain only out-of-pocket pay prices per day for an intermediate care facility (ICF) by region: $63.33 in the northeast; $46.01 in the north central; $43.83 in the south; and $47.44 in the west.

cannot directly discuss the demand for nursing home care. Rather, I analyze the likelihood of nursing home admission and discharge, both of which are positively affected by the demand for nursing home care. For example, the larger the demand for nursing home care, the higher is the likelihood of nursing home entry and, in contrast, the lower is the probability of discharge.

Unlike a more typical production function setting, where an interior solution is assumed and makes sense, in this model of demand for long-term care, corner solutions seem very likely. An interior solution is based on the assumption that all goods are purchased, however, some elderly persons will choose a zero amount of facility care either because they cannot afford it or because they do not need it at all. In this case, the optimal conditions expressed in Eq. 8 and 13 will not be achieved, because the amount of nursing home care in equilibrium is negative. Therefore, the equilibrium conditions at which the amount of nursing home care purchased is zero will be rewritten as:

$U_H H_N / U_X < P_N$, $H^*_N / H^*_F > P_N / P_F$, and $H^*_N / H^*_I > P_N / w$, assuming $P_x = 1$.

First, since the ratio of the marginal utility of health with respect to nursing home care to the marginal utility of consumption goods is smaller than the price ratio of P_N to P_X, in order to maximize the utility, a person will reduce the consumption of nursing home care and to purchase more consumption goods. The second and third inequalities imply that an individual will minimize the total costs of long-term care if he or she reduces nursing home care and increases the consumption of each formal and informal community-based care. Since he or she cannot reduce the amount of facility care less than zero, however, these inequalities are the equilibrium conditions where no nursing home care is purchased (corner solutions).

I also investigate the risk of mortality both in the community and in a nursing home. During a certain period, death can occur to an individual as well as the nursing home entry and discharge. In my theoretical framework, the likelihood of death is positively correlated with the demand for nursing home care (C_N) because "depreciation of the individual's health stock increases both probabilities of death and the demand for long term care" (Headen 1993). However, the state of death is an "absorbing" state from which no transitions are possible and it is considered as a nonrandom event which cannot be statistically controlled. Therefore, under the assumption that the state of death is predetermined for an individual, the probabilities of nursing home use and death can be treated independently, conditional on an individual's health stock.

1-2. Effects of state Medicaid policies on demand and supply for nursing home care

In this section, I discuss how state Medicaid policies will affect an individual's long-term care use through the input prices of long-term care services in the demand function (C_N) and also supply of nursing home care. Six aspects of Medicaid policies are discussed: (i) medically needy program (M_NEEDY); (ii) Medicaid waivers for home and community-based service (H_WAIVER); preadmission screening programs for both (iii) "immediate" (PAS1) and (iv) "expected" Medicaid eligibles (PAS2); (v) the Medicaid reimbursement rate per day (MEDLGRAT); and (vi) the supply of nursing home beds (MEDLGBED). The first three will affect an individual's long-term care use through the input prices of long-term care services in the demand function; and both MEDLGRAT and MEDLGBED will indirectly influence a person's facility use through nursing homes' profit maximization behavior.

1-2-1. Effects on demand

First, the presence of a medically needy program will lower P_N for some out-of-pocket pay patients because this state program covers costs for nursing home care of those who have higher economic resources such as assets and income than the Medicaid qualifying level but who cannot afford institutional care services, and of out-of-pocket pay patients after "spend-down". This M_NEEDY should be positively related to the likelihood of nursing home entry because of the inverse relation of C_N with own-price P_N.

Second, Medicaid coverage for formal community-based care (HCBS) may affect the demand for nursing home care, by lowering the price of formal community-based care. Medicaid coverage for HCBS will lower the price of formal care (P_F), since the presence of a Medicaid coverage program for home care lowers the input price of formal care (P_F), relative to that of nursing home care, P_N. With P_N held constant, a decrease in the input price of formal care will raise nursing home care input prices relative to P_F. Therefore, because of the cross-price effect between C_N

and P_F, C_N should be positively responsive to this program if nursing home care and informal community-based care are substitutes, or negatively responsive if they are complements in the health production function.

The other explanation is based on a decrease in the total amount of informal caregiving time (C_I). Family-level opportunity costs of time for caregiving per capita ($\sum_{i=1}^{n} w_i C_{Ii} /n$) is calculated from three factors as follows: (i) the potential wage rate of each informal caregiver in the labor market (w_i); (ii) the total amount of informal caregiving time ($C_I = \sum_{i=1}^{n} C_{Ii}$); and (iii) the number of informal caregivers (n). However, either the potential market wage rates of the informal caregivers or the number of informal caregivers are predetermined before a state introduced the Medicaid coverage for HCBS. The w_i depends on each caregiver's human capital such as education and health status, and the number of informal caregivers depends on the number of children and household members plus the elderly person's social networks (e.g., friends or volunteer workers). Therefore, the Medicaid coverage for HCBS will affect the second factor, the total amount of caregiving time. If one supposes that an elderly person living in the community needs given amounts of long-term care, the presence of a Medicaid program for HCBS will reduce the total amount of informal caregiving time. If Medicaid covers HCBS, he or she might try to substitute paid community-based care for institutional care or unpaid home care. That will reduce the amount of total time provided by informal caregivers and therefore the time contributed by each caregiver, thus stimulating the utilization of both kinds of community-based care, rather than nursing home care.

Third, preadmission screening programs for both "immediate" (PAS1) and "expected" Medicaid eligible (PAS2), the programs to check whether public services are efficiently allocated to the elderly who need nursing home care but cannot afford it, can be a means of avoiding "moral hazard". Therefore, the PAS programs will directly restrict the amount of nursing home care demanded for Medicaid patients, rather than having an indirect impact through the input price (P_N).

If I distinguish the screening program for "immediate Medicaid eligibles" from the program for "expected Medicaid eligibles", the former will affect the present demand of elderly persons for nursing home care and the latter will influence the future demand. However, Scanlon (1980) and Liu et al. (1991) found, contrary to their prediction, that the [PAS] program for "immediate Medicaid eligibles" increases the probability of nursing home care use. They concluded that because of the variation in the PAS programs among states, interpretation of this result is difficult.

1-2-2. Effects on supply

When controlling for the effects of these policy variables, we have to understand the dual structure of the nursing home market, in which there are two types of clients, private-pay patients and Medicaid-pay clients, who face different input prices of nursing home care. The demand of private-pay patients for nursing home care is price-responsive, while that of Medicaid patients is infinitely elastic at the reimbursement rate in a state (see Section 3-1 in Chapter 1, Figure 1-2). Both MEDLGRAT and MEDLGBED affect not only the decision-making of the supply side on the quantity, quality, and price of long-term care, but also private- and Medicaid-pay clients' nursing home use.

The response of Medicaid patients' nursing home use to a change in the Medicaid reimbursement rate (MEDLGRAT) is ambiguous. One prediction is that an increase in the reimbursement rate will lead to an increase in the private-pay price of nursing home care, which will decrease the number of out-of-pocket patients and will increase Medicaid-subsidized patients. Suppose that the nursing home market is a simple monopoly market. The combined demand curve of private plus Medicaid-pay patients is represented in Figure 2-1. Assuming that a facility serves care for both Medicaid and private-pay patients and pursues profit-maximization, the facility's marginal cost curve can be described as MC. Suppose that a state sets the Medicaid reimbursement rate R_1, which is the price of nursing home care faced by the Medicaid patients in the state. Since a nursing home is a price-taker but it remains a price-maker for private-pay patients, the home as a price discriminator will charge two different prices for the same good - facility care - to these two different patients in order to equalize the level of marginal revenue and of marginal cost in both markets. Therefore, the facility pursues to produce Q_{B1} units of care (at which the marginal cost curve intercepts the demand and also marginal revenue curve for Medicaid patients, $D_{MD1} = MR_{MD1}$), allocating OQ_{A1} and $Q_{A1}\,Q_{B1}$ to private- and Medicaid-pay patients, respectively. The price received in the Medicaid market is R_1; and it is P_1 in the private-pay market. Now, if the state sets a higher reimbursement rate R_2 than R_1, the demand and marginal revenue curves for Medicaid patients shift from $D_{MD1} = MR_{MD1}$ to $D_{MD2} = MR_{MD2}$. Hence, the facility seeks to produce Q_{B2} units of care, allocating OQ_{A2} and $Q_{A2}Q_{B2}$ units of care to private- and Medicaid-pay patients, respectively. The prices received become R_2 in the Medicaid market and P_2 in the private-pay market. Since profit can be increased by charging self-pay clients in the less elastic market a higher price than that paid by Medicaid-pay patients in a market with infinite elasticity, a higher reimbursement rate will motivate a nursing home to raise the out-of-pocket price. Consequently, this will decrease the proportion of self-pay patients to Medicaid patients in a nursing facility.

The other is that an increase in the reimbursement rate will decrease the private-pay price of nursing home care, thus increasing in out-of-pocket patients and decreasing Medicaid-pay clients, by allowing the private-pay demand to be a function of the quality of care provided (Dusansky 1989). Dusansky shows that an increase in the reimbursement rate raises the number of private patients and lowers the number of Medicaid patients, because higher Medicaid reimbursement causes proprietary nursing homes to lose their motivation to spend more to maintain a high quality of care for self-pay patients, which lowers quality and the private-pay price. Dranove (1988) found evidence that, "in the wake of large Medicaid cutbacks in the early 1980s, Illinois hospitals raised prices to private-paying patients", applying the model described by Newhouse (1970) such that, given that most hospitals are not-for-profit institutions, hospitals maximized an objective function which included the quality and quantity of output. However, the recent study of Cohen and Spector (1996) shows that (i) Medicaid reimbursement does not have a direct effect on quality of nursing home care as measured by resident outcomes; (ii) professional staffing intensity has a direct impact on quality of care; however, (iii) tightness of market attenuates the impact of Medicaid reimbursement on quality.

I predict that MEDLGBED is positively related to Medicaid patients' nursing home use. A greater supply of Medicaid-certified beds (MEDLGBED) may widen the price difference between P_N for out-of-pocket-pay and Medicaid patients and thus will reduce the demand for nursing home care for private-pay patients, while increasing it for Medicaid patients. However, many states restricted the supply of nursing home beds in the past. Table 2-1 shows the negative correlation (-0.179) between Medicaid reimbursement rates and the number of Medicaid-certified beds, implying that, in order to maintain the price difference between private-pay and Medicaid patients, states with higher Medicaid reimbursement rates keep down the number of Medicaid-certified beds. The state's policies are consistent with nursing homes' behavior. Based on the finding of Dusansky (1989), states that assign higher Medicaid reimbursement rates will discourage nursing homes from discriminating against Medicaid patients. A decrease in the private price may increase the ratio of private patients to Medicaid patients in nursing homes. Therefore, a nursing home will also favor a lower number of Medicaid-certified beds if a state has higher Medicaid reimbursement rates.

The presence of Medicaid policies that raise elderly Medicaid patients' long-term care use through input prices measures the degree of a state's generosity in relation to long-term care. In general, measures of state generosity are positively correlated (Cutler and Scheiner 1993). Table 2-1 shows the correlations among five state policy variables and private prices faced by out-of-pocket patients. M_NEEDY and H_WAIVER, which indicate the degree of generosity, are positively correlated. A higher number of Medicaid-certified beds also indicates a state's generosity, and it is positively correlated with M_NEEDY. However, states with H_WAIVER are likely to provide a smaller supply of Medicaid-certified beds for the elderly. Bed supply policy and H_WAIVER are targeting completely different purposes for long-term care; the former might encourage institutionalization, but the latter would increase social capability of supporting the elderly living in the community. Consequently, the negative correlation can be interpreted as the difference in state philosophy under a public budget constraint. The interpretation of Medicaid reimbursement rates is difficult. The high reimbursement rates seem to show a state's generosity to Medicaid patients. However, high rates will lead to a decrease in private price and an increase in the proportion of self-pay to Medicaid patients, under the assumption that the total number of nursing home beds is restricted (Dusansky 1989). Therefore, high reimbursement rates are not necessarily associated with a state's generosity to Medicaid patients.

1-3. Determinants of the elderly's nursing home care use

In this section, I specify a model to be estimated in the econometric analysis in this thesis. As I mentioned before, I cannot call the econometric model the demand function for nursing home (Eq. 14), because, as independent variables in the right side, I do not have a exact price of each long-term care input (P_N, P_F, and w) and also because I cannot determine an unmeasurable "stable health" status (H*) to be desired by the elderly. Rather, using the proxies of these variables, I analyze the determinants of the probability of nursing home admission, which is positively related to the demand for nursing home care.

First, I discuss state Medicaid policies as proxies of P_N and P_F in Eq. 14. In order to find out how state Medicaid policies can be included into the econometric analysis, I investigate the endogeneity of a dichotomous variable, whether or not a person is on Medicaid. In the literature review, four studies which included a Medicaid dummy were discussed (Liu et al. 1991; Garber and MaCurdy 1992; Headen 1993; and Ettner 1993): however, none discussed the endogeneity problem connected with a Medicaid dummy. Some of the state policy variables will help determine the probability that a person is on Medicaid. For example, in states with lower (more strict) monthly income standards for aged individuals seeking Medicaid coverage than other states, or in states with preadmission screening programs, the probability of being on Medicaid is lower. In states with generous Medicaid policies, such as a medically needy program, the probability is higher. Thus, I estimate the following two kinds of models: the first, with the Medicaid dummy (m) but without the variables that determine it (**Model I**); and the second, with state policy dummy variables that influence Medicaid eligibility: coverage for "medically needy" persons (M_NEEDY), HCBS waivers (H_WAIVER), and nursing home preadmission screening programs (PAS1 and PAS2), but without the dummy that identifies persons on Medicaid (**Model II**).

Some of the state policies, however, are relevant even with Medicaid coverage held constant. With income and asset standards for Medicaid eligibility held constant, the Medicaid patients' nursing home care use will be influenced by the decision-making of the supply side on the quantity, quality, and price of long-term care. A facility's behavior depends on the Medicaid reimbursement rate (r) and with the supply of Medicaid-certified nursing home beds (q) in the state. Here, r can be considered as the price of nursing home care (P_N) for Medicaid beneficiaries. Suppose that π_n is the probability that an elderly person is admitted to a nursing home. For those who receive Medicaid, π_n is predicted to be negatively related to the state Medicaid reimbursement rate and positively related to the Medicaid-certified bed supply:

$\pi_n = \alpha_0 + \alpha_1 r + \alpha_2 q$ .... Eq. 15

Now consider those who are not on Medicaid. For them, the probabilities depend on the price of nursing home care for self-pay patients (p), but in the model they do not depend on either r or q, if the reimbursement rate and the Medicaid-certified bed supply for non-Medicaid individuals are held constant:

$\pi_n = \beta_0 + \beta_1 p$ .... Eq. 16

Here, introducing two kinds of nursing home prices, r and p, into this model, I will distinguish Medicaid-pay patients from private-pay patients. Pooling the two equations, Eq. 15 and Eq. 16, with the Medicaid dummy (m) that identifies the elderly on Medicaid:

$\pi_n = (1\text{-}m)\ (\beta_0\ + \beta_1\ p) + m\ (\alpha_0 + \alpha_1\ r + \alpha_2 q)$

$= \beta_0 + (\alpha_0 - \beta_0)\ m + \alpha_1\ m\ r + \alpha_2 m\ q + \beta_1\ (1\text{-}m)\ p$.......... Eq. 17

Eq. 17 represents the Model I and it shows a regression of the probability of nursing home admission on the Medicaid dummy (m); the products of m, mr and mq; and the product of (1-m), (1-m)p. The variable names, MEDICAID, MEDLGRAT, MEDLGBED, and LG_PRICE stands for m, mr, mq, and (1-m)p, respectively.

Since the Medicaid dummy (m) is endogenous, I will use dichotomous variables, M_NEEDY, H_WAIVER, PAS1 and PAS2, which determine Medicaid eligibility, without the Medicaid dummy (m), in the Model II. For simplicity, I define a single determinant of Medicaid eligibility as d, instead of these four variables. Suppose that m can be expressed as follows:

$m = \gamma_1 + \gamma_2 d$ .... Eq. 18

Substitute Eq. 18 into Eq. 17,

$\pi_n = \beta_0 + \phi\gamma_1\ + \phi\gamma_2 d + \alpha_1\gamma_1\ r + \alpha_1\gamma_2 dr + \alpha_2\gamma_1 q + \alpha_2\gamma_2 dq + \beta_1\ p - \beta_1\ \gamma_1 p - \beta_1\ \gamma_2 dp$

where $\phi = \alpha_0 - \beta_0$ .... Eq. 19

This is the full version of Model II. However, I do not estimate it because it contains more regressors than Model I, which creates problems associated with multicollinearity. Hence, Model II is a regression of the probability of nursing home admission (π_n) on Medicaid determinants (d); the products of m, mr and mq; and the product of (1-m) and (1-m)p.

Among these policy determinants, I have to specify the role of Medicaid coverage for HCBS as a proxy of the price of formal community-based care (P_F) for frail elderly persons on Medicaid. Formal care may be a substitute or complement for nursing home care. If the state has a formal program providing HCBS for Medicaid eligibles who would otherwise need to be in a nursing home, the probability of home care should rise and the probability of nursing home care should fall.

As I noted in the previous section, both the Medicaid reimbursement rates (r) and the number of Medicaid-certified beds (q) may be relevant for non-Medicaid patients because the private nursing home price (p) and r; and q and the number of nursing home beds for private patients, which was not observed, may be correlated. If they are relevant, equations governing the probability of admission to nursing homes for persons on Medicaid and not on Medicaid are:

$\pi_n = \alpha_0 + \alpha_1 r + \alpha_2 q + \alpha_3 p$

$\pi_n = \beta_0 + \beta_1 r + \beta_2 q + \beta_3 p$.......... Eq. 20

If these two equations are pooled with a Medicaid dummy (m), one gets:

$\pi_n = (1\text{-}m)(\beta_0 + \beta_1 r + \beta_2 q + \beta_3 p) + m(\alpha_0 + \alpha_1 r + \alpha_2 q + \alpha_3 p)$

$= \beta_0 + (\alpha_0 - \beta_0)m + \alpha_1 mr + \alpha_2 mq + \alpha_3 mp + \beta_1(1\text{-}m)r + \beta_2(1\text{-}m)r + \beta_3(1\text{-}m)p$

... Eq. 21

This is a regression of π_n on m, mr, mq, mp, (1-m)r, (1-m)q, and (1-m)p. It can be rewritten as π_n on m, r, q, p, mr, mq, and mp. I avoid estimating Eq. 21 due to the large set of regressors and potentially severe problems of multicollinearity.

Second, I discuss proxies for the price of informal care, which was assumed to be measured by opportunity costs of informal unpaid caregivers. There are two ways to measure this price. One is the family-level average opportunity cost of time for caregiving, given the amount of total caregiving time (Headen 1993); and the other is the caregivers' wage in the labor market (w) and their human capital, such as their educational attainment and health status, which will affect w.

Sources of potential caregivers are indicated by the following three variables: marital status (MARRIED); the number of persons in the household (HHOLD); and the number of children not living in the household (NCHILD). The conclusions of the previous studies suggest that those who do not have these kinds of private networks (because of lack of a spouse, children, or relatives/other, etc.) are at higher likelihood of institutionalization (Wan and Weissert 1981; Garber and MaCurdy 1992; Headen 1993; Greene et al. 1993; Cutler and Sheiner 1993; and Boaz and Muller 1995). In other words, these demographic variables implicitly play a role of "human capital" to produce elderly persons' time of living in the community without institutionalization. Headen, discussing the sources of potential caregivers from the aspect of their opportunity costs, states that "the more caregivers there are to provide any given amount of total caregiver time, the lower the time contribution required of each caregiver and each individual's cost of caregiving is lowered. ...... a reduction in the price of informal caregiver time reduces the hazard of nursing home entry (because of a negative coefficient for the number of potential caregivers)".

Third, I consider an unmeasurable "stable health" status (H*) to be desired by the elderly. Unlike medical care, the purpose of long-term care is to meet basic daily needs for those who have chronic mental and physical limitations. The elderly purchase long-term care to maintain a stable health level, rather than to obtain "improved health". In other words, they desire to keep their present health level as long as possible. Although H* is unmeasurable, therefore, indicators of an elderly person's initial health status (H) at the first interview of the National Long-Term Care Survey in 1982 can be used as a proxy for H*. An individual's initial health stock in 1982 (H) is measured here by the following three variables: (i) functional status, that is, limitations in Activities of Daily Living (ADLs) and Instrumental Activities of Daily Living (IADLs), and medical conditions (e.g., cancer, stroke, lung problems); (ii) demographic characteristics such as race, sex, and age; and (iii) the utilization of medical care to an elderly person such as prehospitalization.

The index of ADLs is based on the exposition in Katz and Akpom (1976) of the hierarchical nature of overall functional status[3]. Most studies have found

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[3] "Independence" and "dependence" for each function are defined as the following:
Bathing: Independent: assistance only in bathing a single part (as back or disabled extremity) or bathes self completely; Dependent: assistance in bathing more than one part of body; assistance in getting in or out of tub or does not bathe self.
Dressing: Independent: gets clothes from closets and drawers, puts on clothes, outer garments, braces, manages fasteners (act of tying shoes is excluded); Dependent: does not dress self or remains partly undressed.
Going to toilet: Independent: gets to toilet, gets on and off toilet, arranges clothes, cleans organs of excretion (may manage own bedpan used at night only and may or may not be using mechanical supports); Dependent: uses bedpan or commode or receives assistance in getting to and using toilet.
Transfer: Independent: moves in and out of bed independently and moves in and out of chair independently (may or may not be using mechanical supports); Dependent: assistance in moving in or out of bed and/or chair, does not perform one or more transfers.

functional disability and/or medical conditions to affect nursing home use significantly (Liu and Mossey 1980; Branch and Jette 1982; Liu and Manton 1983; Weissert and Scanlon 1983; Cohen et al. 1986b; Coughlin et al. 1989; Garber and MaCurdy 1989; Hanley et al. 1990; Liu et al. 1991; Cutler and Sheiner 1993; Boaz and Muller 1994). But, studies differ as to which ADL function is more important. While Weissert and Scanlon (1983) found that dependence in toileting or eating appears more substantial than other functions, Headen (1983) found only bathing to be significant. It has been shown that the number of ADL limitations of an individual is more meaningful for the study of nursing home use than the type of each limitation. Using the hierarchical index developed by Katz and Akpom (1976), I defined five indices for ADLs: if an elderly person is independent all but one of following five ADLs: bathing; dressing; going to toilet; transferring and eating (ADL1); if independent in all but bathing, and one additional function (ADL2); if independent in all but bathing, dressing, and one additional function (ADL3); if independent in all but bathing, dressing, going to toilet, and one additional function (ADL4); and if dependent in all five ADLs (ADL5). These indicators are more accurate expressions of the degree of an elderly person's physical limitations than the number of ADL limitations. For example, if a person has two limitations in ADLs, difficulties in bathing and dressing indicate more severity than difficulties in eating and transferring

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Eating: Independent: gets food from plate or its equivalent into mouth (precutting of meat and preparation of food, as buttering bread, are excluded from evaluation); Dependent: assistance in act of feeding, does not eat at all or parenteral feeding (Katz and Akpom, 1976, p.496).

Katz and Akpom include continence in the index; however, the NLTCS 1982-1984 does not have detailed information on continence and therefore it was excluded in this paper.

because the former tasks require more complicated movements. (Katz and Akpom 1976).

Other measures of the stock of health are based on the person's medical conditions in the last 12 months. There are six dummy variables to represent these conditions: senile (SENILE)[4], cancer (CANCER), stroke (STROKE), lung problems (LUNG), hip fracture (HIPBREAK), and neurological problems (NEUROL).

Also, demographic variables such as race (WHITE), sex (MALE), and age (AGE) will be related to an individual's health stock. The findings of previous studies suggest that whites and males are more likely to use nursing home care. However, it is not very plausible that non-whites have a greater health stock than whites. The possible explanations are that whites may have more resources to pay for institutional care, or, that white persons are likely to survive longer because they have better access to health care, so that whites might be placed in facilities far more often than non-whites. Possible explanations for the finding on sex are that female elderly are likely to survive longer, hence have higher health stocks than males, or that females can be more independent in managing daily life tasks such as preparing meals, doing laundry, or cleaning a house, than males, even if they lost their spouse and live alone.

Under the hypothesis of the health production function (Grossman 1972a, 1972b), an individual's initial stock of health depreciates with age and can be increased by investment. An individual's health stock at the first interview of the

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[4] Senility was the National Long-Term Care Survey code book term for conditions now described as dementia.

National Long-Term Care Survey (NLTCS) in 1982 affects both the demand for long-term care and the likelihood of mortality (either in the community or a nursing home) (Headen 1993) during the survey period. In the context of a health production function, it is assumed that, among the elderly, those who are older, who have more chronic functional disabilities, and who have more medical problems have a lower stock of health. Such persons are assumed to be at higher risk of dying and of nursing home entry, while they are at lower risk of discharge from a nursing home, than elderly who have a larger initial stock of health. An individual's stock of health may decrease with age and the number of chronic functional disabilities increases with age (Grossman 1972b). Therefore, I expect the probabilities of death and of nursing home entry to be higher and the likelihood of discharge from a nursing home to be lower with aging.

The utilization of medical care services, that is, prehospitalization (PRIHOSP), serves as a measure of an individual initial health stock in 1982. While the use of medical services can be interpreted as "gross investment" undertaken by the elderly to produce days or months of healthy living in the community, they also indicate higher probabilities of nursing home entry and mortality in the community. For the impaired elderly, the "gross investment" is an indicator of the severity of an individual illness because "..., given a relatively inelastic demand curve for health, individuals would desire to offset *part* of the reduction in health capital caused by an increase in the rate of depreciation by increasing their gross investments" (Grossman 1972b).

The accessibility of medical care services, indicated by whether or not a person is living in the urban area (URBAN), would be a measure of the price of health care inputs. Based on the assumption that the elderly living in urban areas have more access to medical care services (Scanlon 1980), the transaction cost of obtaining health care would be less.

An elderly person's economic resources as demand variables will influence his or her long-term care utilization desired. As I stated before, since most elderly persons have already retired, they depend on resources other than earnings, namely: (i) monthly income from private and public pensions, and social security; (ii) income from assets and spending of assets; (LOG_ASST); (iii) potential income from other family members (LOG_FINC); and (iv) their own home if they have one (OWNHOME). If an individual's economic status is interpreted directly as his or her ability to afford investment goods for the production of "healthy time" in the community, this obviously implies that the more endowment an individual has, the less the probability of nursing home entry. Alternatively, those with sufficient resources may be less likely to go to a nursing home because they prefer formal community-based care. In contrast, if an individual's economic resources indicates the higher level of health status desired, more economic resources will raise the likelihood of receiving nursing home care. Indeed, for some variables indicating economic status, the findings of previous works are inconsistent. In some studies, the elderly with lower incomes are found to be at higher risk of nursing home admission (Vincent et al. 1979; Cohen et al. 1986b; Boersch-Supan et al. 1988; Liu and Manton

1989), while Chiswick (1976) and Scanlon (1980) found the contradictory result that higher incomes are associated with higher risk of nursing home entry. If liquid assets (interest, dividends, etc.) are distinguished from the flow of income, higher assets raise the risk of nursing home entry (Hanley et al. 1990). Home ownership has been found to reduce the likelihood of using in previous studies (Greene and Ondrich 1990; Hanley et al. 1990; Liu et al. 1991; Garber and MaCurdy 1992; Headen 1993; and Cutler and Sheiner 1993).

Finally, the probability of an elderly person's nursing home care utilization to be estimated in the econometric analysis can be described as:

$$\pi_n = \beta_0 + (\alpha_0 - \beta_0)\, m + \alpha_1\, m\, r + \alpha_2 m\, q + \beta_1\, (1\text{-}m)\, p + \delta\, Z + \gamma\, H + \theta M + \rho E + \varepsilon \qquad \text{.......... Eq. 22}$$

where Z is the set of proxies of the prices of both formal and informal home and community based care; H is the set of proxies which indicates "stable health" status desired by the elderly, including (i) an individual's initial health status in 1982; (ii) demographic characteristics; and (iii) the utilization of medical care for an elderly person; M is the price of health care inputs; E represents economic resources of the elderly; β_0, α_0, α_1, α_2, δ, γ, θ, and ρ are parameters; and ε is an error term. Eq. 22 is almost identified with the demand function for nursing home care (Eq. 14); however, I used a proxy of the price of each long-term care input and proxy indicators to measure the "stable health" status that the elderly desire.

1-4. Summary of the hypotheses

Here, I summarize the hypotheses I test in the empirical analysis. The econometric model to be estimated is based on Eq. 14, but I cannot call it "the demand" for nursing home care because I do not have an exact price of each long-term care input (P_N, P_F, and w) and also because I cannot determine an unmeasurable "stable health" status (H*) to be desired by the elderly. Rather, using proxies for these variables, I will analyze the determinants of the probability of nursing home admission, which is positively related to the demand for nursing home care (Eq. 22). The definitions of all explanatory variables explained in this section are summarized in Table 2-2.

First, the main task of this paper is to investigate the influences of the variation in state Medicaid policies on the likelihood of an elderly person's nursing home care utilization, with respect to seven aspects: (i) an individual's Medicaid status; (ii) a medically needy program (M_NEEDY); (iii) Medicaid waivers for home and community-based service (H_WAIVER); preadmission screening programs for both (vi) "immediate" (PAS1) and (v) "expected" Medicaid eligibles (PAS2); (vi) the Medicaid reimbursement rate per day (MEDLGRAT); and (vii) the supply of nursing home beds (MEDLGBED). These policy variables are assumed to affect the demand for an elderly person's nursing home care through the input prices of long-term care services.

An individual's Medicaid status may affect the risk of nursing home entry positively or negatively. If the Medicaid dummy (m) can be interpreted as a factor to decrease an individual's input price of nursing home care (P_N) relative to other long-term care input prices, those who are on Medicaid might be more likely to go to a nursing home (α_0-β_0 > 0). On the other hand, if m is an indicator of an elderly person's more limited economic resources for long-term care, the Medicaid beneficiaries may less likely to utilize nursing home care (α_0-β_0 < 0).

I expected that the influences of M_NEEDY and H_WAIVER on the likelihood of nursing home use (π_n) are opposite. The presence of M_NEEDY will lower the input price of nursing home care (P_N) and will increase π_n, while H_WAIVER will lower the input price of formal community-based care (P_F), which, P_N held constant, may lead to an increase in the input price of P_N relative to P_F, and, thus, will decrease π_n., if nursing home care and formal home care are substitutes. The preadmission screening program will lower π_n, because it restricts the demand for nursing home care of those who are on the border line of eligibility for Medicaid support of their facility care.

In order to discuss the effects of Medicaid reimbursement (r) and the supply of nursing home beds (q), I distinguish private-pay patients and Medicaid clients. Either r or q will affect the profit maximization behavior of nursing homes which try to differentiate Medicaid patients and out-of-pocket patients. Therefore, either variable will influence the quantity of care supplied and π_n differently among two types of nursing home patients. Suppose that the nursing home market is a simple monopoly market. Then higher Medicaid reimbursement will motivate a nursing home to differentiate Medicaid patients and private patients and to increase the price for self-pay patients (p) (see Section 1-2-2 in Chapter 2, Figure 2-1). Therefore, I can expect that an increase in p will decrease π_n of private patients and increase π_n of Medicaid patients ($\alpha_1 > 0$). But if nursing homes are assumed to be in monopolistic competition (Dusansky 1989), two alternative predictions as to a nursing home's profit maximization behavior are possible, depending on whether a change in marginal revenue from private patients with respect to an additional unit of discriminatory pricing costs of differentiating their care from that of Medicaid and patients is larger than a change in marginal revenue from Medicaid patients. One prediction is that higher r will lead to an increase in p, which will decrease the number of private-pay patients and will increase the number of Medicaid patients ($\alpha_1 > 0$). The other is that the higher r will discourage nursing homes from production differentiation in favor of private patients and, thus, it may lower p and increase private patients and decrease Medicaid patients ($\alpha_1 < 0$). Dusansky's (1989) empirical findings supported the second prediction ($\alpha_1 < 0$).

The supply of Medicaid-certified beds (q) is expected to be positively related to Medicaid patients' nursing home use ($\alpha_2 > 0$). Under the assumption that the total number of nursing home beds is restricted, a higher q will motivate a nursing home to distinguish Medicaid-client care from private patient care and it may increase p, which decreases the private patients' facility use and increases the Medicaid patients' facility use.

Second, I discuss the effects of prices of long-term care inputs on π_n. Since I do not have an exact price of each long-term care input, I included a proxy of the input price. The effect of the state average weekly wage in Intermediate Care Facilities (ICFs) (a proxy for p) on private patients' demand for nursing home care will be negative and, thus, its effect on π_n will be negative ($\beta_1 < 0$), unless nursing home care is a Giffen good, which is most unlikely.

In Eq. 22, Z, which represents the set of proxies for the prices of both formal and informal home care, includes variables such as H_WAIVER, MARRIED, HHOLD, and NCHILD. In this equation, therefore, H_WAIVER plays overlapping roles in relation to π_n as a determinant of Medicaid eligibles and as a proxy for formal community-based care price (P_F). I expect that the cross-price effects between P_F and the demand for nursing home care are negative ($\delta < 0$) because I assume that nursing home care and formal community-based care are substitutes. The demographic variables, MARRIED, HHOLD, and NCHILD, which are assumed to represent proxies for the family-level average opportunity costs of caregiving time per informal unpaid caregiver, is also expected to have a negative effect on π_n ($\delta < 0$).

Third, I discuss the estimation of the effects of H* on the probability of nursing home use. Since the "stable health" condition to be desired (H*) by the elderly is unmeasurable, I used an initial health stock at the first interview of the National Long-Term Care Survey in 1982 (H) as proxies of H*.

Effects of limitations in ADLs and IADLs and medical conditions depend on the type of problem involved, I expect that having more physical and mental difficulties raises the demand for nursing home care, and, therefore, the likelihood of admission ($\gamma > 0$). However, those who have lung problems, that is, pneumonia or bronchitis, might be discriminated against by a nursing home because these diseases are contagious. Thus, with respect to LUNG, γ could be negative. But, LUNG also includes those with emphysema and/or asthma, which are not contagious. Out of 1,150 persons who had lung diseases is the percents with pneumonia, bronchitis, emphysema, or asthma are 10.5%, 34.6%, 31.3%, and 23.6%, respectively. Therefore, for those elderly who had lung diseases, 45.1% had contagious diseases, but more than half (54.9%) did not. Besides, pneumonia and bronchitis are curable diseases. One possible explanation on a negative effect of LUNG is that nursing homes do not have special facilities such as a respirator to provide intensive medical care for those who have advanced lung diseases.

All demographic variables, WHITE, MALE, and AGE, are expected to have positive effects on π_n ($\gamma > 0$). In particular, AGE will have a significantly positive effect on π_n because an individual's health stock depreciates with age.

The utilization (PRIHOSP) of medical care can be interpreted as "gross investment" undertaken by the elderly to produce days or months of healthy living in the community. For PRIHOSP, γ will be positive, because one's previous utilization of medical care may be an indicator of the severity of an individual illness for the impaired elderly.

The accessibility of medical care (URBAN), indicating the price of health care inputs, will affect negatively the likelihood of nursing home use ($\theta < 0$). As mentioned previously, the transaction cost of obtaining heath care is less and thus the demand for health care is higher in urban areas than in rural areas. Since the health status of the elderly who are living in urban areas will be better than who are not, therefore, the demand for long-term service may be lower in urban areas.

The interpretation of an elderly individual's economic resources, LOG_ASST and LOG_FINC, are ambiguous. ρ could be negative if I regarded these variables as an individual's ability to pay for investment for the production of "healthy time" in the community or as economic resources to afford formal community-based care. However, ρ could be positive if economic resources indicate that a higher level of health status is desired and more demand for a nursing home care. Most previous studies found that home owners are less likely to go to a nursing home than renters. Thus, for OWNHOME, $\rho < 0$. Since the elderly who own a home do not meet the requirements of Medicaid eligibility, most of them have to complete "spend-down" before they become eligible if they utilize nursing home care. If the elderly person is a homeowner, he or she can prepare room for live-in caregivers and the home can be adapted to ADLs.

The likelihood of elderly persons' nursing home discharge is shown by π_d, and of mortality, either in the community or in a nursing home by π_m. These variables can also be estimated by the same form as Eq. 22. The price of a nursing home care input is expected to be positively related to both the likelihood of a nursing home discharge and that of death either in the community or in a nursing home. While the prices of formal and informal community-based care will negatively affect the probability of a nursing home discharge; however, they will positively affect the probability of mortality. The larger the demand for nursing home care, the higher is the likelihood of nursing home entry and, in contrast, the lower is the probability of discharge. Therefore, the effect of long-term care input prices on the likelihoods of nursing home entry and discharge would be completely opposite. The lower the price of the inputs, the less is the likelihood of dying, because the utilization of long-term care constitutes an investment to maintain a "stable health" condition. A higher initial health stock (H) will lead to a higher probability of a nursing home discharge and less likelihood of dying either in the community or a nursing home.

2. Econometric specification

In this section, I discuss the econometric methods I use for analyzing the influences of the variation in Medicaid policies among states and an elderly individual's characteristics on the transition probabilities of nursing home entry and discharge and the likelihood of mortality either in the community or in a nursing home. First, I introduce the application of the competing-risk model to the transition probabilities of interest, and discuss the conditional independence of competing-risks on an individual's health stock.

Competing-risk models are frequently used by studies in medical science or demography, e.g., the multiple-cause death of patients who had heart surgery (prosthetic replacement of the mitral valve) (Litwak et al. 1969), survival time of acute leukemia patients after bone marrow transplantation by each cause of death, the influence of smoking on the timing of death from vascular disease, cancers, and other causes (Holt 1978), the timing of death of breast cancer (Chiang 1968) and lung cancer patients (Lubin 1985), and the mortality risks of the elderly (Yashin, Manton, and Stallard, 1986).

After Lancaster (1990) used duration analysis in the study of unemployment in 1979, it became common in economics, especially, labor economics (e.g., Heckman and Singer 1986; and Kiefer 1988). However, competing-risk models as an application of event history (or duration) analysis are seldom used in social science. Lancaster (1990) stated, in discussing competing-risks, that "..... in social science applications the latent failure-times do not appear generally to be meaningful. For example, consider a model in which a person may be employed, unemployed, and looking for work, or out of the labor force. The notion of the time it would take an unemployed person to drop out of the labor force given that he is precluded from taking employment is clearly nonsense. Eliminating a possible destination will generally alter people's behavior". This criticism is based on the assumption that competing-risks be statistically independent. Lancaster (1990) also discussed the relaxation of this independence assumption through introducing the unobserved heterogeneity terms. The heterogeneity components associated with the competing-risks are allowed to be correlated (Butler et al. 1989). Nonetheless, there are a few studies on the application of competing-risks to economic analysis, estimating the duration of unemployment which may end with either a new job or dropping out of the labor force (Diamond and Hausman 1984); a spell of unemployment which may end with either returning to the previous job or taking a new job (Kaz 1986; and Han and Hausman 1990); partial and full retirement (Sueyoshi 1987); and the influence of physical job requirements and health conditions on the timing of retirement (Chirikos and Nestel, 1989).

Second, I distinguish a semi-parametric model (the Cox proportional hazard) from other parametric approaches, and I will discuss on the benefits of using a semi-parametric model. Third, in terms of using the Weibull-gamma distribution, I try to measure (but not correct) the effect of unobserved heterogeneity across individuals on each transition probability. Finally, the model with time-varying covariates for an individual health status is introduced.

In this paper, three kinds of empirical results are shown. The first two empirical analyses (other than the model with time-varying covariates) are based on the transition probabilities during a single period. (1) I estimate the transition probabilities of the elderly both in the community and in a nursing home between the interviews of the 1982 and 1984; and the 1984 and 1989 National Long-Term Care Survey (NLTCS), separately. As explanatory variables, I use individuals' characteristics at the interview in 1982 for the period 1982-1984; and those at the interview in 1984, for the period 1984-1989. (2) Furthermore, I treat the period between the interviews of the 1982 and 1989 NLTCS as a single period, using an individual characteristics in 1982 as independent variables. For these estimations, the explanatory variables are regarded as being time-invariant, assuming that individuals' characteristics do not change during the study period. (3) Finally, some of individual characteristics are treated as time-varying covariates and both characteristics at the interviews in 1982 and 1984 are used in the same equation.

2-1. The competing-risks model

For economic analysis of transition probabilities from the community to a nursing home and from a nursing home to the community, the following econometric methods have been employed: bivariate or multinomial logistic regression analysis (Cohen et al. 1986; Hanley et al. 1990; Green and Ondrich 1990; Cutler and Sheiner 1993; Greene et al. 1993; and Boaz and Muller 1994); a probit model (Ettner 1993); a Markov chain model (Garber and MaCurdy 1990; and Norton 1992); and competing-risk models (Cohen, et al. 1988; Liu et al. 1991; and Headen 1993). In this study, competing-risk estimates were used. There are two advantages of using this model. One is that, since dependent variables are continuous (the duration of being the community or in a nursing home), the results will be biased if we use bivariate or multinomial regression models of which dependent variables are discrete. The other is that, using competing-risk estimates, we can measure the tendency of potential multiple events to occur simultaneously at a specified point in time. In this paper, I estimate the competing-risks both in the community and in a nursing home, that is, (1) the probabilities from the community to a nursing home or death in the community; and (2) the probabilities from a nursing home to the community or death in a nursing home.

During the study period, for those who are living in the community, two transitions could occur; one is the transition from the community to a nursing home; and the other is exit from the community by death. Individuals who were admitted to a nursing home in the study period might leave the nursing home because of discharge to the community or death[1]. Either case has latent failure (or exit) times T_1, T_2 corresponding to the two failure (or exit) types $J \in \{1, 2\}$, but we can actually observe only the smaller of these two latent times. Alternatively, we may not observe either event $J \in \{1 \text{ or } 2\}$ if no transitions occur to an individual up to the end of the observation period (right-censored problem). Although T is right-censored, the observed failure time and type, T and J, can be given by $T = \min(T_1, T_2)$ and $J = \{j \mid$

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[1] Some are transferred to another nursing home or to a hospital. Those who are hospitalized may die in hospital.

$T_j \leq T_k$, $k = 1, 2\}$, where T_j are random variables. Suppose that, for those who are in the community, "1" stands for admission to a nursing home and "2" stands for death; and, for those who are in a nursing home, discharge to the community is denoted by "1" and death is again denoted by "2". This is the basic formulation of the "competing-risks" problem, which occurs when there are two or more failure (exit) types ($J \geq 2$).

Prentice and Kalbfleisch (1978) noted that interrelations between failure types j and k, thus dependency between T_j and T_k, arise in the analysis of failure times with competing-risks[2]. If T_j and T_k, T_1 and T_2 in this study, are assumed to be statistically independent, cause-specific hazard functions can be simply applied to this model.

Headen (1993), in discussing the dependence between the time at which an individual might leave the community through a nursing home admission and the time of death, stated that T_1 and T_2 are "positively correlated because of a common underlying mechanism: health status", saying that "depreciation of the individual's health stock – which may be manifested by disabilities and medical conditions – increases both the likelihood of death and the demand for long-term care". However, the state of death is an "absorbing" state from which no transitions are possible and it is considered as a nonrandom type of failure (exit) which cannot be statistically controlled. Yashin et al. (1986) assume that the state of death by each cause can be

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[2] Prentice and Kalbfleisch (1978) questioned the identification of independence between failure types j and k with statistical independence between T_j and T_k, because these latent failure times do not have any clear physical meaning, so that the hypothesis of independence between them is untestable by data. Most previous studies assume either that T_j and T_k are independent (Katz 1986) or that, mainly for k = 2, T_1 and T_2 are dependent with bivariate normal (or log-normal) distribution (Diamond and Hausman 1984).

treated independently. The "trajectory" of the process of death by each cause is given with respect to each individual's physiological characteristics such as age, functional status (ADLs and IADLs) and medical conditions, which, they state, cannot be statistically controlled. Under the assumption that the state of death is a nonrandom failure type and is predetermined for an individual, Liu et al. (1991) and Headen (1993) treated the probabilities of a nursing home care and death independently, conditional on the vector of an individual's health stock. Therefore, both studies treated mortality as censored when focusing on the transition probability from the community to a nursing home, while the probability of a nursing home admission was treated as censored when they estimated the likelihood of death.

As indicated in the previous section, for three single periods: (1) 1982-1984; (2) 1984-1989; and (3) 1982-1989, I estimate the influences of state Medicaid policies, prices of long-term care inputs, and an elderly person's initial health stock at the interview in the start of each study period on two transition probabilities in the competing-risks framework: (i) the probability of either nursing home entry (π_n) or mortality (π_m) in the community; (ii) and the likelihood of either nursing home discharge (π_d) or death in a nursing home (π_m). The probability function (Eq. 22 in the section 1-3 of the Chapter 2) can be rewritten in the following regression form:

$\ln T_j = \beta_{0j} + z' \beta_j + \sigma\omega_j$ for $j = 1, 2$ .... Eq. 1

where z represents the vector of explanatory variables; the disturbance term ω_j takes the value, $-\infty < \omega_j < +\infty$; σ is an unknown parameter, which should be estimated from the data. If ω_j are assumed to be independent each cause-specific likelihood function is estimated as a single risk model in which the alternative failures are treated as censored.

For the purpose of this paper, there are two kinds of dependent variables to be estimated - the length of stay in the community; and the length of stay in a nursing home. The first is specified to be the interval between the interview date and the first admission to a nursing home (T1) or the date of death (T2) if a person died in the community without a nursing home entry in the study period. The second must be estimated with multi-state (competing) risks as well as multi-episode methods because an individual might have multiple nursing home stays in the study period. Liu et al. (1991) avoid the complexity of multi-episode situations by combining all observed spells in the nursing home of an individual, based on the idea that, for those who had multiple stays, each can be considered of as "part of the same long-term condition". The empirical results of this paper are based on this method. If an individual went to a nursing home more than once, the length of a stay is specified as the sum of the spells. Hence, the length of a nursing home stay is completely observed if an individual was alive in the community (T1); it is right-censored if an individual was alive but still in a nursing home; and it is completely observed but is treated as if right-censored if an individual had died in a nursing home (T2), by the last interview day.

Although I used the length of stay either in the community or in a nursing home as dependent variables, I estimate the hazards, which is the same as the risks or the probabilities in the context of duration analysis, of two transitions (i) from the community to a nursing home or death; and (ii) from a nursing home to the community or death. The cause-specific hazard functions can be defined as:

$$\lambda_j(t; z) = \lim_{\Delta t \to 0} \frac{P\{t \le T < t + \Delta t, J = j | T \ge t; z(t)\}}{\Delta t} \quad \text{for } j = 1, 2 \text{ .... Eq. 2}$$

where z(t) denotes the vector of individual characteristics at time t. The function $\lambda_j(t; z)$ represents for the instantaneous hazard rate from cause j at time t, given the covariates z(t), in the presence of the other competing-risks ("crude" hazard rate; Yashin et al. 1986). Since I assume that T_1 and T_2 are independent, conditional on a given individual's characteristics including health stock such as age, functional status (ADLs and IADLs) and medical conditions, the hazards, $\lambda_1(t; z)$ and $\lambda_2(t; z)$, are also presumed to be independent. Therefore, the overall hazard function can be written in terms of the aggregated cause-specific hazard function.

$$\lambda(t; z) = \sum_{j=1}^{2} \lambda_j(t; z) \text{ .... Eq. 3}$$

Suppose that z(t) is time invariant such that $z(t) = \bar{z}$. Thus the overall survivor function $S(t; \bar{z})$ can be specified as:

$$S(t; \bar{z}) = \exp \{-\int_0^t \lambda(u; \bar{z})\, du\} = \exp \{-\int_0^t \sum_{j=1}^{2} \lambda_j(u; \bar{z})\, du\}$$

$$= \prod_{j=1}^{2} \exp \{-\int_0^t \lambda_j(u; \bar{z})\, du\} \text{ .... Eq. 4}$$

Also, the cause-specific density $f_j(t; \bar{z})$ for time to failure is defined as:

$$f_j(t; \bar{z}) = \lim_{\Delta t \to 0} \frac{P\{t \le T < t + \Delta t, J = j | \bar{z}\}}{\Delta t} = \lambda_j(t; \bar{z}) \cdot S(t; \bar{z}) \quad \text{for } j = 1, 2 \text{ .... Eq. 5}$$

Note that $f_j(t; \bar{z})$ is not the density of the overall probability function, where

$\int_0^\infty f_j(u; \bar{z})du = P(J = j\,|\bar{z}) = \varphi_j(\bar{z}) \neq 1$ because $\varphi_j(\bar{z})$ is the transition probability for the jth cause, given the covariate vector $\bar{z}$ so that $\sum_{j=1}^{2} \varphi_j(\bar{z}) = 1$ (Blossfeld et al. 1989).

Suppose that t_i and j_i stand for denoted the failure time and the cause of failure for the ith individual, where $i = 1, \ldots\ldots, n$. In order to specify the likelihood function for maximum likelihood estimation, a censoring indicator δ_i is defined such that $\delta_i = 1$ if the ith individual fails at time t_i; $\delta_i = 0$ otherwise. Therefore, the likelihood function for the ith individual is specified by:

$$
\begin{aligned}
L_i &= f_j(t_i; \bar{z}_i)^{\delta_i} \cdot S(t_i; \bar{z}_i)^{1-\delta_i} \\
&= \{\lambda_{ji}(t_i; \bar{z}_i) \cdot S(t_i; \bar{z}_i)\}^{\delta_i} \cdot S(t_i; \bar{z}_i)^{1-\delta_i} \\
&= \lambda_{ji}(t_i; \bar{z}_i)^{\delta_i} \cdot S(t_i; \bar{z}_i) \\
&= \lambda_{ji}(t_i; \bar{z}_i)^{\delta_i} \cdot \prod_{j=1}^{2} \exp\{-\int_0^{t_i} \lambda_j(u; \bar{z}_i)\,du\} \qquad \ldots\ldots\ldots\ldots \text{Eq. 6}
\end{aligned}
$$

where $\lambda_{ji}(t_i; \bar{z}_i)$ shows the instantaneous hazard rate for the ith individual from cause j at time t_i, given the ith individual's characteristics, $\bar{z}_i$. Therefore, the total likelihood function is obtained by the following formulation:

$$
\begin{aligned}
L &= \prod_{i=1}^{n} \{\lambda_{ji}(t_i; \bar{z}_i)^{\delta_i} \cdot S(t_i; \bar{z}_i)\} \\
&= \prod_{i=1}^{n} \lambda_{ji}(t_i; \bar{z}_i)^{\delta_i} \cdot \prod_{j=1}^{2} \exp\{-\int_0^{t_i} \lambda_{ji}(u; \bar{z}_i)\,du\} \qquad \ldots\ldots\ldots\ldots \text{Eq. 7}
\end{aligned}
$$

This likelihood function can be rearranged by decomposing the likelihood for each j such that $L = \prod_{i=1}^{n} L_i = \prod_{j=1}^{2} L_j$. If a censoring indicator is redefined such that $\delta_{ij} = 1$ if the ith individual fails from the jth cause at time t_i; otherwise $\delta_{ij} = 0$, then the contribution of the jth cause to the likelihood function is formulated by:

$$L_j = \prod_{i=1}^{n} \lambda_j(t_i; \bar{z}_i)^{\delta_{ij}} \cdot \exp\{-\int_0^{t_i} \lambda_j(u; \bar{z}_i)\, du\}$$

$$= \prod_{i=1}^{n} \lambda_j(t_i; \bar{z}_i)^{\delta_{ij}} \cdot S_j(t_i; \bar{z}_i) \text{ .... Eq. 8}$$

where $S_j(t_i; \bar{z}_i)$ is the cause-specific survivor function such that $S(t_i; \bar{z}_i) = \prod_{j=1}^{2} S_j(t_i; \bar{z}_i)$. Thus, the overall likelihood function is:

$$L = \prod_{j=1}^{2} \{\prod_{i=1}^{n} \lambda_j(t_i; \bar{z}_i)^{\delta_{ij}} \cdot S_j(t_i; \bar{z}_i)\} \qquad \text{.......... Eq. 9}$$

This function implies that all failures from causes other than j can be treated as censored at each individual time of failure, t_i (Kalbfleisch and Prentice 1978)[3].

2-2. Semi-parametric approach (the Cox proportional hazard model)

In this section, I introduce a semi-parametric approach and discuss why it is more useful than a parametric model for analyzing the probabilities of a nursing home care use among the elderly. The Cox proportional hazards model, a semi-parametric approach which assumes that the baseline hazard rate is arbitrary, can be applied to

---

[3] However, this approach may have limitations on the accuracy of estimation, as the number of failure types increases, thus increasing the number of parameters (Blossfeld et al. 1989).

estimation of the cause-specific hazard rates, $\lambda_j(t;\bar{z})$. The Cox proportional hazards model is characterized by:

$\lambda_j(t; \bar{z}) = \lambda_{0j}(t) \exp(\bar{z}'\beta_j)$ for $j = 1, 2$ .... Eq. 10

where $\lambda_{0j}(\ ) \geq 0$ is arbitrary and a nuisance function and $\lambda_{0j}(\ )$ may be different for different types of failure.

Unlike a semi-parametric approach, in a parametric approach, an investigator is assumed to have full information on the distribution of tastes over the population of interest, and, thus, full information on the distributions of (i) the basic hazard, $\lambda_{0j}(t)$; (ii) the survival function, $S(t; \bar{z})$; and (iii) the density function, $f_j(t; \bar{z})$. Therefore, a parametric approach requires us to specify the function of $\lambda_{0j}(t)$ given the explanatory vectors, z. For example, it could be a Weibull, an exponential, a log-logistic, a log-normal, or a gamma distribution; or a mixed distribution, such as a Weibull-gamma, or an exponential-gamma. Since I do not have information on the exact distribution of the eldery's tastes concerning nursing home care because it is unobservable, however, the arbitrary assumption of the Cox proportional hazard model on the basic hazard is advantageous.

Second, parametric models are based on the assumption of homogeneity of the distributions of (i) the basic hazard, $\lambda_{0j}(t)$; (ii) the survival function, $S(t; \bar{z})$; and (iii) the density function, $f_j(t; \bar{z})$ across individuals, because an investigator will assign a distribution form to these functions. Parametric analysis might lead to the misspecification of estimated parameters and standard errors caused by heterogeneity within the population of interest[4]. The econometric model in this paper includes two types of failures (exits) among the elderly living in the community, those who enter a nursing home and who die without going to a nursing home, and the distribution of the tastes of population regarding nursing home care use may vary between them. Therefore, the disturbance, ω_j in Eq. 1, represents the additive heterogeneity terms from the distributions of the tastes of both a groups. Again, the arbitrary assumption as to the basic hazard is appropriate since the basic hazard can be different for different types of failure.

Third, when the hazard which depends upon time-varying covariates is involved, the semi-parametric approach is helpful. In this case, the data consist of both the failure (exit) time and the covariates path, or how an individual's characteristics have changed over time. Even if I have full information on the distribution of people's tastes and the shape of the distribution of the probabilities of failures (exits) given the covariates path, the probability distribution of the covariates path itself is unobservable.

The hazard rates $\lambda_j(t; \bar{z})$ are said to be proportional if there exist constants C_j such that $\lambda_j(t; \bar{z})/\lambda(t; \bar{z}) = C_j$, which means that the ratio $\lambda_j(t; \bar{z})/\lambda(t; \bar{z})$ depends not on time but on the failure type. If this is the case, with $\varphi_j(\bar{z})$, which is the cause-specific probability for the jth cause, given the covariate vector $\bar{z}$, $\varphi_j(\bar{z}) \equiv P(J = j \mid \bar{z}) = C_j$ can be proved (David and Moeschberger 1978).

---

[4] In order to correct the effect of heterogeneity across individuals, the Weibull-gamma model is suggested by Greene, W.H. (1987) (originally suggested by Went-Tai, H.). I discuss this method in the next section.

$$\varphi_j(\bar{z}) \equiv P(J = j \mid \bar{z}) = \int_0^\infty f_j(u; \bar{z})du = \int_0^\infty \lambda_j(t; \bar{z}) \cdot S(t; \bar{z})du = \int_0^\infty C_j \cdot \lambda(t; \bar{z}) \cdot S(t; \bar{z})du$$

$$= C_j \int_0^\infty \lambda(t; \bar{z}) \cdot S(t; \bar{z})du = C_j \int_0^\infty f(u; \bar{z})du = C_j \quad \text{for } j = 1, 2 \text{ .... Eq. 11}$$

Suppose that baseline hazard rates intended to be proportional to another are set such that

$\lambda_{0j}(t) = \lambda_0(t)\exp(\beta_{0j})$. So, one can obtain: $\lambda_j(t; \bar{z}) = \lambda_0(t)\exp(\beta_{0j})\exp(\bar{z}'\beta_j)$ $= \lambda_0(t)\exp(\beta_{0j} + \bar{z}'\beta_j)$. Using the result of Eq. 3 and 11,

$$\varphi_j(\bar{z}) = \lambda_j(t; \bar{z})/\lambda(t; \bar{z}) = \frac{\exp(\beta_{0j} + \bar{z}'\beta_j)}{\sum_{j=1}^{2}\exp(\beta_{0j} + \bar{z}'\beta_j)} = \frac{\exp(\bar{z}'\beta_j)}{\sum_{j=1}^{2}\exp(\bar{z}'\beta_j)} \text{ .... Eq. 12}$$

By definition, β_{0j} is a constant term. The contribution of the jth cause to the full likelihood function for the Cox proportional hazards model is:

$$L_j = \prod_{i=1}^{n} [\lambda_{0j}(t_i)\exp(\bar{z}'_i\beta_j)]^{\delta_{ij}} \cdot \exp\{-\int_0^{t_i} \lambda_{0j}(u)\exp(\bar{z}'_i\beta_j)du\}$$

$$= \prod_{i=1}^{n} [\lambda_{0j}(t_i)\exp(\bar{z}'_i\beta_j)]^{\delta_{ij}} \cdot \exp\{-\int_0^{t_i} \lambda_{0j}(u)du\}^{\exp(\overline{z_i'}\beta_j)}$$

$$= \prod_{i=1}^{n} [\lambda_{0j}(t_i)\exp(\bar{z}'_i\beta_j)]^{\delta_{ij}} \cdot S_{0j}(t_i; \bar{z}_i)^{\exp(\overline{z_i'}\beta_j)} \text{ .... Eq. 13}$$

Thus, the overall likelihood function is:

$$L = \prod_{j=1}^{2} \{\prod_{i=1}^{n} [\lambda_{0j}(t_i)\exp(\bar{z}'_i\beta_j)]^{\delta_{ij}} \cdot S_{0j}(t_i; \bar{z}_i)^{\exp(\overline{z_i'}\beta_j)}\} \text{.......... Eq.14}$$

Since both parameter β_j and baseline hazard rate $\lambda_{0j}(t)$ are unknown, Eq.14 can not be used for the estimation of β_j. Therefore, the Cox proportional hazards model is estimated in terms of the factorization of the likelihood function. Assume that the risk set $R(t_{j(i)})$ is the set of individuals specified to be at risk from failure type j just before t_i, where $t_{j(i)}$, $i = 1, \ldots\ldots, d_j$, denotes the times at which individuals fail from the jth cause, and assume that $\bar{z}_{j(i)}$ are $\bar{z}$ evaluated at $t_{j(i)}$. In the likelihood function, $[\lambda_j(t; \bar{z})]^{\delta_{ij}} = [\lambda_{0j}(t_i) \exp(\bar{z}'_i \beta_j)]^{\delta_{ij}} = 1$ if the censoring indicator $\delta_{ij} = 0$, and thus, in fact, only the individuals who fail from the jth cause can be considered. Therefore, the overall hazard rates are described as $\lambda(t; \bar{z}) = \sum\limits_{l \in R(t_{j(i)})} \lambda_{0j}(t_i) \exp(\bar{z}'_l \beta_j)$ and the cause-specific hazard rates can be rewritten, based on Eq. 12, $\lambda_j(t; \bar{z}) =$

$$\frac{\exp(\bar{z}'_{j(i)} \beta_j)}{\sum\limits_{l \in R(t_{j(i)})} \exp(\bar{z}'_l \beta_j)} \cdot \lambda(t; \bar{z}) = \frac{\exp(\bar{z}'_{j(i)} \beta_j)}{\sum\limits_{l \in R(t_{j(i)})} \exp(\bar{z}'_l \beta_j)} \cdot \sum_{l \in R(t_{j(i)})} \lambda_{0j}(t_i) \exp(\bar{z}'_l \beta_j).$$

From Eq. 12 and 14, one can obtain:

$$L = \prod_{j=1}^{2} \{ \prod_{i=1}^{d_i} \frac{\exp(\bar{z}'_{j(i)} \beta_j)}{\sum\limits_{l \in R(t_{j(i)})} \exp(\bar{z}'_l \beta_j)} \sum_{l \in R(t_{j(i)})} \lambda_{0j}(t_i) \exp(\bar{z}'_l \beta_j) \cdot S_{0j}(t_i; \bar{z}_i)^{\exp(\overline{z_i'} \beta_j)} \}$$

with $S_{0j}(t_i; \bar{z}_i) = \exp(-\int_0^{t_i} \lambda_{0j}(u) du)$ ....Eq. 15

Since the first term of Eq. 15 is only dependent on β, the Cox proportional hazards model is estimated by maximizing:

$$PL = \prod_{j=1}^{2} \{ \prod_{i=1}^{d_i} \frac{\exp(\bar{z}'_{j(i)} \beta_j)}{\sum\limits_{l \in R(t_{j(i)})} \exp(\bar{z}'_l \beta_j)} \} \text{ .... Eq. 16}$$

which is called "partial likelihood function" by Cox (1972).

2-3. Heterogeneity

The arbitrary assumption of the basic hazard in the Cox proportional hazard model, which is the method of partial likelihood, permits us to analyze transition data without specifying an exact distribution of people's tastes (Lancaster 1990). By using a semi-parametric method, one may measure (but not correct) the misspecification caused by heterogeneity among sample persons.

An assumption of homogeneity of the survival distribution across individuals has two possible effects: (i) parameter estimates will be inconsistent and/or (ii) disturbances will be based on inappropriate standard errors (W.H.Greene 1990). In order to modify the heterogeneity effect, Greene (1990) suggested using a parametric model which assumes that the baseline hazard is distributed as Weibull-gamma. Suppose that the survival function is described as:

$$S(t ; \bar{z} \mid V_j) = \prod_{j=1}^{2} V_j \exp\left[-[\exp(\bar{z}'\beta_j)t]^{\alpha_j}\right],\ t > 0 \text{ and } \alpha_j > 0 \text{ .... Eq. 17}$$

where the random variable, V_j, is assumed to be the effect of heterogeneity among those who exit by the j th cause and the mean of V_j is presumed to be 1. Therefore, the overall survival function can be described as:

$$S(t ; \bar{z}) = \prod_{j=1}^{2} \int_0^{\infty} V_j \exp\left[-[\exp(\bar{z}'\beta_j)t]^{\alpha_j}\right] d\, V_j$$

$$= \prod_{j=1}^{2} \int_0^{\infty} (1/\Gamma(\alpha_j)) \exp(-V_j) V_j^{\alpha_j - 1} \exp\left[-[\exp(\bar{z}'\beta_j)t]^{\alpha_j}\right] d\, V_j$$

$$= \prod_{j=1}^{2} [1 + \theta_j [\exp(\bar{z}'\beta_j)t]^{\alpha_j}]^{-\frac{1}{\theta_j}} \quad \text{.......... Eq. 18}$$

where $\theta_j = 1/\alpha_j$. Therefore, $\theta_j = 0$ corresponds to the Weibull model. The further θ_j deviates from 0, the greater is the effect of the heterogeneity. The Weibull survival function emerges if the limit of $S(t ; \bar{z})$ as θ_j goes to 1 is estimated.

2-4. Models with time-dependent covariates

Now, the set of covariates, z(t), is no longer time invariant. Suppose that the covariates z(t) vary over time, but z(t) are constant over intervals (or periods) defined in discrete time. Therefore, the model assumes that a covariate will change at the starting point of an interval if information on more than two intervals is available. Since the hazard function is sensitive to the exact time when an individual's characteristics were changed, for an empirical analysis including time-variant covariates, we ideally have to have a longitudinal survey which is conducted constantly in every short period, such as a monthly or quarterly survey. Although the NLTCS used for empirical analysis in this paper is a longitudinal survey, it includes information on an elderly person's long-term care use and his or her demographic, economic, and health characteristics, based on an interview in each year, 1982, 1984 and 1989, and, thus, it has two intervals between the interviews. Indeed, the NLTCS is not necessarily the most appropriate to a model with time-dependent covariates. I do not know the exact time when an individual's characteristics were changed, because the NLTCS was carried out on the same individuals only three times from 1982 through 1989. However, an individual's functional status as indicated by limitations in ADLs and IADLs and medical conditions is not expected to change within a short interval. Using change in an individual's health status between the 1982 and 1984 waves of the NLTCS allows us to assume that the change occurred at the start of the second interval starting in 1984. The research involving changes in state Medicaid policy variables as time-varying covariates is possible in the future, because, with regard to state Medicaid policies, we can determine exactly when these were changed[5].

The overall hazard function and the survivor function can be written as:

$$\lambda(t; z(t)) = \sum_{j=1}^{2} \lambda_j(t; z(t)) \text{ .... Eq. 19}$$

$$S(t; z(t)) = \exp\{-\int_0^{t} \lambda(u; z(u))\, du\} = \exp\{-\int_0^{t} \sum_{j=1}^{2} \lambda_j(u; z(u))\, du\}$$

$$= \prod_{j=1}^{2} \exp\{-\int_0^{t} \lambda_j(u; z(u))\, du\} \text{ ....Eq. 20}$$

Also, the cause-specific density $f_j(t; z(t))$ for time to failure is defined as:

$$f_j(t; z(t)) = \lambda_j(t; z(t)) \cdot S(t; z(t)) \quad \text{for } j = 1, 2 \text{ .... Eq. 21}$$

Suppose that t_i and j_i denote the failure time and the cause of failure for the ith individual, where $i = 1, \ldots\ldots, n$. In order to specify the likelihood function for maximum likelihood estimation, a censoring indicator δ_i is defined such that $\delta_i = 1$ if the ith individual fails at time t_i ; $\delta_i = 0$ otherwise. Therefore, the likelihood function for the ith individual is specified by:

$$L_i = f_j(t_i; z_i(t))^{\delta_i} \cdot S(t_i; z_i(t))^{1-\delta_i}$$

---

[5] When the 1994 NLTCS becomes available to the public, therefore, we can use the duration model with time-varying covariates more appropriately for an analysis of how the major changes in states' Medicaid policies enacted in 1989 affected the likelihood of an elderly person's nursing home use.

$$= \lambda_{ji}(t_i; z_i(t))^{\delta_i} \cdot \prod_{j=1}^{2} \exp\{-\int_{0}^{t} \lambda(u; z(u))\, du\} \text{ .... Eq. 22}$$

where $\lambda_{ji}(t_i; z_i(t))$ shows the instantaneous hazard rate for the *i*th individual from cause *j* at time t_i, given the *i*th individual's time-dependent characteristics, $z_i(t)$. Therefore, the total likelihood function is obtained by the following formulation:

$$L = \prod_{i=1}^{n} \{\lambda_{ji}(t_i; z_i(t))^{\delta_i} \cdot S(t_i; z_i(t))\}$$

$$= \prod_{i=1}^{n} \{\lambda_{ji}(t_i; z_i(t))^{\delta_i} \cdot \prod_{j=1}^{2} \exp\{-\int_{0}^{t_i} \lambda_{ji}(u_i; z_i(u)\, du\} \text{ .... Eq. 23}$$

Here, I focus only on the transition probabilities from the community to a nursing home or death because not enough observations who have been in nursing homes from the first through the second study periods are available for a econometric analysis.

For the dependent variable, I used the length of stay in the community in the first period if a person exits in the first period; and the added lengths of stay in the community in the first and second periods are used, if a person did not exit from the community in the first period.

I treated nine indicators as being time-independent as follows: four state policy dummy variables that determine Medicaid eligibility (M_NEEDY, H_WAIVER, PAS1, and PAS2); two demographic variables (WHITE and MALE); variables indicating the accessibility of medical care (URBAN); and individuals' family income (LOG_FINC). The three state-specific indicators, the Medicaid reimbursement rates for Intermediate Care Facilities (ICFs), the number of Medicaid certified nursing home beds, and a state's average weekly wage for ICFs, are fixed over time because no data are available in 1984. However, the number of elderly persons who are eligible for Medicaid has changed from 1982 through 1984 (Table 2-6). Therefore, the interaction terms of a Medicaid dummy and these variables (MEDLGRAT, MEDLGBED, and LG_PRICE) are also treated as being time-dependent variables. All explanatory variables other than the above are treated as time-varying covariates in the regression.

2-5. Conclusion

In the previous section, I discussed the econometric methods I use for analyzing the influences of the variation in Medicaid policies among states and an elderly individual's characteristics on the probabilities of nursing home entry and discharge and the hazard of mortality either in the community or in a nursing home. The previous discussion shows four points: (i) the independence among competing-risks conditional on an individual's health stock; (ii) the benefits of using a semi-parametric model; (iii) collection of the unobserved heterogeneity across individuals by using the Weibull-gamma distribution; and (iv) the model with time-varying covariates for an individual health status.

The empirical analysis presents the results of (i) a semi-parametric approach; (ii) a parametric approach based on the assumption that the baseline hazards are distributed as Weibull-gamma, in order to discuss the problems caused by heterogeneity; and (iii) a semi-parametric baseline hazard function with time-varying covariates. The results of other parametric approaches, which assume that the baseline hazard are distributed as Weibull, exponential, or log-logistic will be presented as an Appendix.

3. Data

The empirical analysis of this thesis is based on the 1982, 1984, and 1989 National Long-Term Care Surveys (NLTCS), conducted by the United States Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation, and the Health Care Financing Administration [HCFA]. The overall purpose of this data base is to provide "considerable information on which both to plan the nature of required services and to develop private insurance products to pay for such services" from a cross-sectional perspective, and to provide "a basis upon which to examine changes in the home long-term care [LTC] populations and to examine likely trends in the need for services at the individual level" [1] from a longitudinal perspective.

As I explained in the previous section, the empirical analyses in this paper are based on the transition probabilities between the community and a nursing home and the likelihood of death either in the community or in a nursing home. There are two assumptions that: (i) explanatory variables are time-invariant during the study period (a single-period model); and that (ii) they are time-varying (a two-period model).

Three kinds of results are shown. Based on the first assumption, (1) I estimate the transition probabilities of the elderly between the interviews of the 1982 and 1984; and the 1984 and 1989 National Long-Term Care Survey (NLTCS), separately. As explanatory variables, I use individuals' characteristics at the interview in 1982 for the period 1982-1984; and these at the interview in 1984 for the period 1984-1989.

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[1] Excerpt from Duke University, Center for Demographic Studies, Jan. 6, 1988, "Overview and Use of the Public Use Data Files of the 1982 and 1984 National Long-term care Surveys", pp.2-3.

(2) Also, I treat the period between the interviews of the 1982 and 1989 NLTCS as a single period, using an individual characteristics in 1982 as independent variables.
(3) Based on the second assumption, since some of individual characteristics are time-varying, I analyze the transition probabilities occurred between 1982 and 1989 in a two period framework and thus both characteristics at the interviews in 1982 and 1984 are included in the same equation. For estimating the likelihoods of nursing home discharge and mortality in a nursing home from 1982 through 1989, we need observations who were in nursing homes (censored) at the end of the first period (or, the start of the second period), regardless of the assumption that an individual characteristics are time invariant or varying. However, there are not enough observations for econometric analysis to estimate these likelihoods in a nursing home[2]. Therefore, I estimate only the probabilities of nursing home entry and mortality in the community for the period 1982-1989 (for (2) and (3)).

The numbers of sample persons for the single-period competing-risks model are 4,547 and 464 in 1982-1984; and 1,985 and 254 in 1984-1989, for the transition probabilities from the community to other statuses and for the transitions from a nursing home to other statuses, respectively. For estimating the transition probabilities in the community between 1982 and 1989, I use 3,125 and 1,985 sample persons, for a single (2) and a two period model (3), respectively. Those were interviewed in both 1982 and 1984 and survived to start, if not always complete, the second survey period, 1984-1989.

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[2] For those who were staying in a nursing home at the start of the second period (1984-1989), the number of months I was able to calculate is only 38.

In all three surveys of 1982, 1984, and 1989, the NLTCS asked detailed questions on limitations in ADLs and IADLs, and other health status items. For the limitations in ADLs and IADLs, sample persons were asked whether they need anyone's help and/or any equipment; how often they need them now; or how long they had needed them; who helps them; the number of helpers; whether they utilize paid (formal) help or not; and so forth. As for other health status items, interviewees were asked about chronic medical conditions in the last 12 months, e.g., pneumonia, bronchitis, a broken hip, cerebral palsy, and a stroke. Respondents were also asked about the amount of income from various sources[3] and their health insurance coverage (Medicaid, other public assistance programs, or private health insurance plan).

Other data sources for this study are "Medicaid Eligibility for the Elderly in Need of Long-term care"[4] and "Health Care Financing Program Statistics, Medicare and Medicaid Data Book, 1984"[5]. These publications provide information on state long-term care policies and the Medicaid reimbursement rate per day for ICF services calculated as total Medicaid payments for ICF services divided by total service days

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[3] The questionnaire includes the following sources of income: social security benefits or railroad retirement benefits; Veterans Administration [VA] compensation or pension; other retirement, pension, or annuity income; unemployment or workers' compensation; Supplemental Security Income; earnings from job or business; net income from rent of apartment, other real estate, roomers or boarders; contributions from friends or relatives; interest or dividends; and others.

[4] Arizona's Medicaid program was excluded because nursing home care is not yet covered under it. Puerto Rico, Guam, the Virgin Islands, the Northern Mariana Islands and American Samoa also were excluded because their Medicaid programs are significantly different from the other 50 states (Newschler, September, 1987, "Medicaid Eligibility for the Elderly in Need of Long-Term Care", Congressional Research Service).

[5] United States Department of Health and Human Services, June 1986, *Health Care Financing Program Statistics, Medicare and Medicaid Data Book, 1984*, Baltimore, Maryland.

of ICF services. For a proxy price of private patients, I used a state average weekly wage of ICFs based on information from "Employment and Wages, Annual Averages 1993"[6].

3-1. Data for single-period competing risks

3-1-1. The study period, 1982-1984

In 1982, at the first stage, 35,789 candidates for the sample, drawn randomly from the Medicare Health Insurance Skeleton Eligibility Write-Off [HISKEW] file, were screened to identify those who are 65 years of age and over, live in the community, and have at least one limitation in either Activities of Daily Living [ADLs] or Instrumental Activities of Daily Living [IADLs] for the three-month reference period[7]. As a result of the screening interview, 6,393 persons were screened for the detailed community interview and 6,088 persons have completed it (response rate: 95.2%)[8]. Out of the 6,088, 5,580 had been disabled for the three-month reference period.

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[6] United States Department of Labor and the Bureau of Labor Statistics, 1994, *Employment and Wages, Annual Averages 1993*, Washington, D.C..

[7] The index of ADLs was developed by Katz, S. et al. (1963). ADLs are those basic activities that most people take for granted in their everyday routine. They include personal care activities like eating, bathing, dressing, using the toilet, getting in and out of bed, and/or getting around inside and outside the house. IADLs are other activities which are generally part of the daily routine, like preparing meals, doing laundry, light housework, shopping for groceries, managing money, taking medicine, and/or making telephone calls (Bureau of the Census, 1984, "Long-Term Care Survey: Personal Visit Interviewer's Reference Manual", LTC-5 (PV), pp.B1-B2).

[8] Those who were deceased or institutionalized, or had moved outside the country, on 3-31-1982, and on or after 4-1-82 and before the interview, were deleted from the list of screeners. 25,518 were screened out of 31,911 because they were not chronically dependent in any ADL or IADL functions.

In addition to those who were screened in the 1982 detailed household survey (6,393), the 1984 survey rescreened candidates: (i) who had been not previously included for the detailed interview of those who were institutionalized in 1982; (ii) who might turn age 65 between 1982 and 1984; and (iii) who had not reported chronic disability in ADLs and IADLs in 1982. Consequently, 11,256 persons were screened in as candidates for the detailed interview in 1984.

There are three kinds of questionnaires in the 1984 NLTCS: the community, the institutional, and the deceased questionnaires. The number of persons who received the community questionnaires was 6,265 (55.7%); the institutional questionnaires were used for 1,773 (15.8%); and proxy-interviews using the deceased questionnaires were obtained for 3,219 (28.6%). The response rates are 89.7% (10,099 out of 11,256) as a whole; 94.73% (5,934) for the community interview; 95.32% (1,690) for the institutional interview; and 76.9% (2,475) for the proxy interviews for deceased persons[9].

The exact number of sample persons used in this study is 5,795. Since this analysis focuses on transitions between the community and nursing homes and mortality either in the community or a nursing home in the period 1982-1984, sample persons who had completed both the 1982 and the 1984 detailed questionnaires, for which the sample size is 5,795, were chosen for the present analysis. The community, institutional, and deceased questionnaires involved 4,182 (72.2%), 414

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[9] Throughout the survey, the screening interviews were completed by telephone and all the detailed interviews were completed by a personal visit. If the sample person was mentally and/or physically unable to answer the interview questions, the interviewer would seek a proxy respondent who knew about regular care obtained or needed by the sample person.

(7.1%), and 1,199 (20.7%) persons, respectively. Of 5,795 observations, I used 4,547 for the analysis of transition from the community to other statuses; and 464 for the study of transition from a nursing home to other statuses, because of missing data on crucial variables. The same person might appear in both analyses. In these two studies, 777 observations were lost because of missing data on state Medicaid policy variables; 296 and 4,527 were lost because I was unable to follow their status to obtain length of stay in that status: 146 and 22 individuals do not have information on coverage under Medicaid; and 29 and 5 do not have data on number of household members, respectively.

In order to describe the data characteristics measured in 1982, I summarize the means and standard deviations of all explanatory variables used to analyze the transition which occurs in the community and in a nursing home, in Tables 2-3 and 2-4. Figures are broken down by censoring status. Of 4,547 observations who were living in the community at the interview in 1982, 558 (12.3%) moved from the community to a nursing home; and 819 (18.0%) died in the community by the interview in 1984. For those who were admitted to a facility between 1982 and 1984 (464), 134 (28.9%) individuals were discharged and 76 (26.4%) died in a nursing home.

Both tables show that the basic statistics are different between those who exit from one status to other and those who are treated as censored. Therefore, in order to control for the moving average, a duration approach needs a censoring indicator.

3-1-2. The study period, 1984-1989

For the estimation, I use the 1984 and 1989 NLTCS. The 1989 NLTCS covers persons in the community and in a nursing home, but unlike the 1984 survey, there is no next-of-kin interview for the deceased. Thus, the 1989 NLTCS includes i) survivors assigned a detailed community interview in the 1984 survey (3,660); ii) those assigned an institutional interview (700) in the 1984 survey; iii) candidates for the detailed interview from among those who found to be non-disabled in the 1984 survey (5,000); iv) those who turned age 65 between 1984 and 1989 (5,000); and v) those age 75 and over, who were not in the prior subsample (2,265). 6,700 persons were screened in as candidates for the detailed interview in 1989, out of 16,625. Out of the 6,700, 6,120 persons has completed a detailed interview (with a response rate of 91.3% - 4,600 (75.2%) for the community interview and 1,520 (24.8%) for the institutional interview).

In order to investigate the longitudinal trend, I use the same samples (5,795 observations) as the previous study period (1982-1984) for estimating the transition probabilities both in the community and in a facility between the interviews in 1984 and in 1989. Of 5,795 persons, I used 1,985 for the analysis of transition from the community to other statuses; and 254 for the study of transition from a nursing home to other statuses in this study period, because of missing data on crucial variables. The same person might appear in both analyses. In these two studies, 777 observations were lost because of missing data on state Medicaid policy variables; 1,199 were lost because they died between 1982 and 1984 so that I was not able to obtain the data needed from the 1989 NLTCS; 1,420 and 3,565 were lost because I was unable to follow their status to obtain length of stay in that status; and, for estimating the likelihoods from the community to other statuses, 414 have to be excluded because they were in a nursing home at the interview in 1984.

In Tables 2-3 and 2-4, the means and standard deviations of all explanatory variables used to analyze the transition probabilities in the community and in a nursing home, respectively, in the study period, 1984-1989. Figures are broken down by censoring status. Of 1,985 observations who were living in the community at the interview in 1984, 318 (16.0%) moved from the community to a nursing home; and 126 (6.4%) died in the community by the interview in 1989. Out of those who were admitted to a facility between 1984 and 1989 (254), 51 (20.1%) individuals were discharged and none died in a nursing home during the study period.

3-1-3. The study period, 1982-1989

Based on the assumption that explanatory variables are time-invariant during the study period, I treat the period between the interviews of the 1982 and 1989 NLTCS as a single period, using an individual characteristics in 1982 as independent variables. Of 5,795 sample persons, therefore, 1,248 were lost because of the same reasons as the study on the transition probabilities in the community between 1982 and 1984. In addition, for those neither who entered a nursing home nor who died in the community in this period (3,170 persons), 1,422 were lost because I was unable to follow their status to obtain length of stay in that status after the interview in 1984.

As results, I use 3,125 for the analysis of transition from the community to other statuses between 1982 and 1989.

In Tables 2-5, the means and standard deviations of all explanatory variables used to analyze the transition probabilities in the community in the study period, 1982-1989. Figures are broken down by censoring status. Of 3,125 observations who were living in the community at the interview in 1982, 815 (26.1%) moved from the community to a nursing home; and 857 (27.4%) died in the community by the interview in 1989.

3-2. Data for two-period competing risks

In order to include individuals' time-varying characteristics in the analysis, I use the 1982, 1984, and 1989 NLTCS. The sample used for estimation must include the elderly who had completed detailed questionnaires at least in 1982 and 1984, because an individual's initial status in both periods, 1982-1984 and 1984-1989, are used as time-varying explanatory variables for the regression. As mentioned before, 5,795 persons had completed both the 1982 and 1984 detailed questionnaires. Of these, I will use 1,985 observations because of missing data on crucial variables. First, I excluded 1,199 persons who died in the first survey period, between 1982 and 1984, because the deceased questionnaire in the 1984 NLTCS did not include information on health status at the time of death. Second, I have to exclude 414 persons because they were in a nursing home at the interview in 1984. Third, 1,420 were lost because I was unable to follow their status to obtain length of stay in that status; and 777 persons have to be excluded because of missing data on state Medicaid policy variables.

I treated nine indicators as being time-independent: four state policy dummy variables that determine Medicaid eligibility (M_NEEDY, H_WAIVER, PAS1, and PAS2); two demographic variables (WHITE and MALE); and variables indicating the utilization and the accessibility of medical care (PRIHOSP and URBAN); and individuals' family income (LOG_FINC). The three state-specific indicators, the Medicaid reimbursement rates for Intermediate Care Facilities (ICFs), the number of Medicaid certified nursing home beds, and a state's average weekly wage for ICFs, are fixed over time because no data are available in 1984. However, the number of elderly persons who are eligible for Medicaid changed between 1982 and 1984 (Table 2-6). Therefore, the interaction terms of a Medicaid dummy and these variables (MEDLGRAT, MEDLGBED, and LG_PRICE) have been also treated as being time-dependent variables. All explanatory variables other than the above are treated as being time-varying covariates in the regression.

To describe the data characteristics of the 1,985 sample persons, I summarized the means and standard deviations of time-varying explanatory variables classified by censoring status (Tables 2-6). The mean of a Medicaid dummy increases by about 16.4% from 1982 through 1984, among all elderly groups. An increase in the Medicaid recipients among the elderly may be caused by a decrease in their own economic resources, such as assets and home ownership. In particular, the result from Table 2-6 suggests that those who enter a nursing home face a higher risk of losing their assets and home than those who stay in the community. While the assets of those who stay in the community decreased by 7.5%, those of nursing home users drop by 10.6%. Also, the home ownership of the former group decreases by 42.7%, while that of the latter declines by 67.3%.

With regard to demographic indicators, the numbers of both married elderly persons and children living outside the household tend to decrease, but the number of persons living in the same household is apt to increase during the survey periods (however, for those who died in the community, both HHOLD and NCHILD decrease). This suggests that, when a disabled parent has lost his or her spouse, children will move into the same house as their parents as substitute informal caregivers. Otherwise, the frail elderly have to enter a nursing home, if they have fewer sources of informal caregiving other than their spouses. For those who enter a nursing home (C→N), compared with those who stay in the community or who died in the community (C→C or D), the number of married elderly persons decreases more, by 12.1%, and the number of persons living in the same household increases more, by 6%, from 1982 through 1984. On the other hand, for those who died in the community (C→D), compared with those who stay in the community or who entered a nursing home (C→C or N), the number of married elderly persons decreases more, by 68.2%, and the number of persons living in the same household also decreased more, by 11.6%.

As Manton (1995) predicted, among those who stay in the community or who died without going to a nursing home, the percent of elderly persons who have functional limitations declines. I obtained almost the same result as Manton. The percent with limitations in all five ADLs (bathing; dressing; going to toilet; transferring; and eating) decreases by 13.4%, among those people. However, for those who entered a nursing home, the percent of the elderly who have two or more limitations in ADLs increases. With regard to acute medical conditions, among all elderly groups, the percents of those who are senile and who have cancer and stroke tend to increase, while the percent with lung diseases, a hip fracture, and NEUROL is apt to decrease, during the survey period.

Chapter 3

Results and Summary

1. Competing-risks model

This section presents the empirical results from analyzing the influence of state Medicaid policies, prices of long-term care inputs, and an elderly person's initial health stock at the interview in the 1982 and 1984 National Long-Term Care Survey (NLTCS) on two transition probabilities in each period, 1982-1984 and 1984-1989: (i) that of a nursing home entry or death in the community and (ii) that of a nursing home discharge or death in a nursing home, using the competing-risks framework. As stated in section 2-1 of Chapter 2, I treated the probabilities of death either in the community or in a nursing home as being independent of the probabilities of nursing home entry and discharge, conditional on those individual characteristics which are difficult to control statistically. Therefore, under the assumption that the state of death is a nonrandom failure type and is predetermined for an individual, the estimation method requires a separate estimate for (i) each risk of a nursing home entry and death in the community; and for (ii) each risk of a nursing home discharge and death in a nursing home, in which the alternative failure type can be treated as censored.

I use two different estimation methods; (i) a semi-parametric basic hazard estimation; and (ii) a parametric approach that assumes that the baseline hazards are distributed as Weibull-Gamma. The former method assumes that the basic hazards are arbitrary and it allows the basic hazard to be different for different types of failure.

The arbitrary assumption as to the basic hazard in a semi-parametric estimation method is advantageous because an exact distribution of people's tastes relating to nursing home use is unobservable, and also because there are two types of failure in the elderly and the distribution of tastes might be different between the two populations. The latter method is used in order to measure the size of the effects of heterogeneity and to correct the influences of explanatory variables.

The sample number used for the estimation is 4,547 and 1,985 for the risks in the community, and 464 and 254 for the risks in a nursing home, for each period, 1982-1984, and 1984-1989. During the first study period (1982-1984), out of the 4,574 elderly, 558 individuals had entered a nursing home (3,989 (87.7%) who stay in the community plus those who died without going to a nursing home during the study period are treated as censored, for estimating the risk of nursing home entry); and 819 had died without going to a nursing home (3,728 (82.0%) which includes those who stay in the community without dying plus those who entered a nursing home during the survey period are censored, for estimating the risk of mortality in the community). For the risks in a nursing home, out of 464 persons, 134 individuals had been discharged to the community (330 (71.1%) who stay in a nursing home without discharge plus who died in a nursing home during the survey period are censored, for estimating the risk of nursing home discharge); and 76 had died in a nursing home without discharge (388 (83.6%) which include those who stay in a nursing home without discharge plus those who were discharged from a nursing home during the survey period are censored for estimating the risk of mortality in a nursing home).

During the second study period (1984-1989), on the other hand, out of the 1,985 elderly, 318 individuals had entered a nursing home (1,667 (84.0%) who stay in the community plus those who died without going to a nursing home during the study period are treated as censored, for estimating the risk of nursing home entry); and 126 had died without going to a nursing home (1,859 (93.7%) which includes those who stay in the community without dying plus those who entered a nursing home during the survey period are censored, for estimating the risk of mortality in the community). For the risks in a nursing home, out of 254 persons, 51 individuals had been discharged to the community (203 (80.0%) who stay in a nursing home without discharge plus who died in a nursing home during the survey period are censored, for estimating the risk of nursing home discharge); however, no observations died in a nursing home without discharge.

First, I will show results of a semi-parametric baseline hazard model and, secondly, I present results of a Weibull-Gamma distribution approach.

1-1. Semi-parametric baseline hazard

Tables 3-1-1, 3-1-2, 3-2-1, and 3-2-2 show regression results of a semi-parametric baseline hazard model for the probabilities of nursing home entry, of mortality in the community, of nursing home discharge, and of mortality in a nursing home, respectively. In all tables, the first four columns relates to the study period 1982-1984 and the second four columns relates to 1984-1989. A positive coefficient is interpreted as a higher risk of exit and so a shorter duration in a status, while a negative coefficient can be interpreted as a lower risk of exit and so a longer duration in a status. The second column of each regression gives percentage effects of a unit change in each of the covariates on the probability of transition between statuses.

1-1-1. Transition probabilities from the community to a nursing home or death (Tables 3-1-1 and 3-1-2)

During the study period, 1982-1984, the effects of an individual's Medicaid status on a nursing home entry and mortality are opposite. Compared to the non-Medicaid population, those who are on Medicaid are more likely to enter a nursing home and less likely to die in the community. This supports the hypothesis that, for those on Medicaid, an input price of a nursing home (P_N) relative to other long-term care input prices is lower than for those who are not on Medicaid. Therefore, more utilization of nursing homes will decrease the probability of death in the community for those who are on Medicaid. The direction of the coefficients of a Medicaid dummy confirmed with the exceptions, but the effects on both risks are not statistically significant. In the second study period (1984-1989), the effects of Medicaid dummy on both risks are not statistically significant, either.

The effects of state Medicaid policies on an elderly person's nursing home use vary (Table 3-1-1).: Medicaid coverage for nursing home use of "medically needy" elderly persons and Medicaid coverage for community-based care have significant but opposite effects on the hazard of nursing home admission. For both study periods, M_NEEDY increases the risk of nursing home entry by approximately 30%, while

H_WAIVER has a significant negative effect on the probability of nursing home use by 19.1 %, only in the first study period. The direction of the coefficient of H_WAVIER in the second study period is the same as the one in the first period, however, it is not statistically significant and the size of effect is very small (2.4%). These results support the hypothesis that M_NEEDY will decrease the input price of nursing home care (P_N) and H_WAIVER may increase the input price of P_N relative to the input price of formal paid home care (P_F), P_N held constant, in an individual's health production function. Nonetheless, both the size and significance of the effect of H_WAIVER on an elderly person's nursing home use is inconsistent among the study periods.

A "medically needy" program would encourage utilization of nursing homes because it covers costs for those who have higher resources and income than the Medicaid qualifying level but who cannot afford institutional care, and for out-of-pocket pay patients after "spend-down". In contrast, Medicaid coverage for home care might discourage utilization of institutional care because disabled elderly persons living in states with this program can receive in the community the same level of services as they would get in a SNF or ICF. A negative coefficient of H_WAIVER suggests that nursing home care and formal paid community-based care are substitute goods. Since H_WAIVER is considered as a proxy of P_F for frail elderly persons on Medicaid, an approximate cross-price elasticity (which can be estimated directly from the coefficient) between nursing home and formal home care is 0.22. Thus, a 10% decrease in P_F may decrease the probability of nursing home use by 2.2%. These results are very important because they suggest that these state Medicaid policies could influence input prices of long-term care and that an emphasis in state Medicaid policy on formal community-based care can reduce an individual's risk of nursing home care utilization.

Although the effects of M_NEEDY and H_WAIVER on the risk of mortality in the community are statistically insignificant, the results that the presence of both state Medicaid programs raise the probability of death in the community seem to be odd (the negative effect of H_WAIVER on mortality risk in 1984-1989 is understandable) (Table 3-1-2). One possible explanation is that the presence of these programs might be influenced by the elderly's needs for public paid long-term care, and, thus, by the elderly's lower income level in a state. This lower income indicates their lack of economic resources for long-term care, which may lead to higher risk of mortality.

I expected that PAS1 and PAS2 act to restrict present and future nursing home admissions, respectively, but neither screening program has a significant effect on the transition probability of either nursing home entry or death in the community in 1982-1984. With regard to PAS1, I obtained the significant positive effect on the risk of mortality in 1984-1989, suggesting that the more restricted Medicaid policy for institutional care a state has, the more the elderly will die in the community (Table 3-1-2). However, this result is not statistically consistent among the study periods.

For those who are on Medicaid, higher Medicaid reimbursement rates will decrease nursing home entry risk in both Models I and II; and more Medicaid-certified beds will increase it in Model II in the first study period, results which are also consistent with the hypothesis, however, these variables have no statistically significant effects. During the second study period, however, both effects of MEDLGRAT and MEDLGBED on a person's nursing home use are statistically significant. A unit increase in the log value of Medicaid reimbursement rates will decrease an individual's nursing home use by 45.4% in Model II; and more Medicaid-certified beds will increase it in both Models I and II (Table 3-1-1).

As a proxy for the nursing home price for private-pay patients, I used the state average weekly wage for Intermediate Care Facilities (ICFs). The result suggests that, due to a unit of increase in the price of nursing home care, the risk of out-of-pocket patients' nursing home entry is lowered by approximately 14% and 6%, in 1982-1984 and 1984-1989, respectively. Table 3-1-1 shows that the approximate own-price elasticity of nursing home care for private patients is -0.15 and -0.07, which means that a 50% increase in P_N would decrease the probability of out-of-pocket patients' nursing home use by 7.5% and 3.5%, in each period, 1982-1984 and 1984-1989. The difference of own-price elasticities of nursing home care for private patients between two study periods may be due to a change in elderly person's preference for facility care. The older, the less responsive to the price of institutional care. Compared with the findings in earlier studies, however, the result obtained in either period is much more inelastic. For example, Chiswick (1976), Scanlon (1980), and Headen (1993) predicted own price elasticity of nursing home care as -2.3, -1.12, and -0.7, respectively. This may be because I distinguish Medicaid-pay patients from private-pay patients.

Most of the demographic variables significantly affect hazards of both nursing home entry and mortality in the community in both periods. Table 3-1-1 shows that the risk of nursing home entry is 35% and 26% lower if an elderly person is married rather than not married, 12% and 14% lower if there is one more person in the same household than the average, and 10% and 7% lower if there is one more child living outside the household than the average, in 1982-1984 and 1984-1989, respectively. These results are consistent with prior findings that the price of informal caregivers' time is negatively related to the hazards of nursing home entry (Headen 1993). Also, this is evidence suggesting that both having more potential caregivers and the presence of a Medicaid coverage program for community-based care will decrease the likelihood of nursing home entry, because both factors will lower the input prices of informal and formal community-based care relative to the input price of a nursing home care, P_N held constant. This is evidence that a nursing home care and informal unpaid community-based care are substitute goods.

The effects of these demographic variables on the risk of mortality in the community are inconsistent between two-periods (Table 3-1-2). While the probability of death is not significantly affected by marital status during the first period, it increases by almost 89% if a person is married during the second period. On the contrary, the mortality risk is 10% more if there is one more person in the same household than the average and 5% lower if one more children are living outside the household than the average, in 1982-1984; however, the effects of these variables are not statistically significant, in 1984-1989. If one becomes older, whether or not his or her spouse survives together is a more significant indicator to measure an individual health status than either HHOLD or NCHILD.

The result of the first period may be due to reverse causality, such that, when an elderly person is very sick, a caregiver may come to live in the same household. This suggests that HHOLD could be interpreted as an indirect indicator of not only informal caregivers' opportunity costs, but also the severity of an individual's illness. Given extremely poor health, an elderly person needs help from somebody in the same household. That the utilization of informal care has a significant positive impact on the risk of mortality in the community supports this rationale.

As a measure of an individual's *initial health stock*, I used three variables: (i) an individual's health status indicated by limitations in ADLs and IADLs, and medical conditions; (ii) demographic characteristics (race, sex, and age); and (iii) the utilization of, and access of an elderly person to, medical care (PRIHOSP, and URBAN). An individual's health status has a significant impact on risks of both institutionalization and mortality in the community in 1982-1984. With respect to the hazards of nursing home entry, in particular, those who have limitations in any IADLs and/or are dependent in all five ADLs face a much higher risk of institutionalization than those who do not. The risks of nursing home entry for those who have limitations in any IADLs are 174.1~178.3% higher and for those who have limitations in all five ADLs are 108.3~112.8% higher, compared with those who do not have them. The more sever the limitations in ADLs, the higher the probability of a nursing home entry. In 1984-1989, only the coefficients of ADL2 and ADL5 are statistically significant. As the probability of nursing home entry among those who have limitations in all five ADLs is higher by 66.7~69.2% than those who not, the size of effect of ADL5 becomes less than the first study period (Table 3-1-1).

The effects of the limitations in ADLs on the probability of dying in the community are totally opposite between the first and second periods (Table 3-1-2). In 1982-1984, all the coefficients are significantly positive and the more sever the limitations in ADLs, the higher the probability of dying. On the contrary, in 1984-1989, the coefficients of ADL1, ADL2, and ADL5 are significantly negative. The result in the second period is odd because an individual's health stock must be negatively correlated to the limitations in ADLs. For the oldest-old, chronic conditions may not be necessarily good indicators for measuring the level of health stock. Those who have limitations in ADLs may more often access medical care than those who do not. Therefore, they may be diagnosed their acute medical conditions before they get seriously ill. Nonetheless, the effects of IADLs on the mortality risk in the community are consistent between both periods (Table 3-1-2). The risks of dying for those who have limitations in any IADLs are almost 70% and 320% higher in each period, compared with those who do not have them.

Medical conditions have significant influences on risks of both nursing home entry and mortality in the community and the direction of these indicators' effects on both risks are more consistent between two study periods than the ones of ADLs

(Tables 3-1-1 and 3-1-2). Therefore, we may conclude that the acute medical conditions are better indicators for measuring an individual health stock than chronic health statuses, such as ADLs. However, as I expected, LUNG has a significantly negative effect on the probability of nursing home entry in both periods (See section 1-4 of Chapter 2). Those who have lung problems, that is, pneumonia, and/or bronchitis might be discriminated against by a nursing home because these diseases are contagious. But, among those who had lung diseases, more than half had emphysema and/or asthma, which are not contagious. Moreover, pneumonia and bronchitis are curable diseases. Therefore, a possible explanation for the negative effect of LUNG on the probability of nursing home admissions is that nursing home do not have special facilities such as a respirator to provide intensive medical care for those who have advanced lung diseases.

Second, with regard to demographic variables indicating an individual health stock, being white (WHITE) has a significant positive effect on the risk of nursing home entry in both periods; but the effects on the risk of mortality in the community are inconsistent between 1982-1984 and 1984-1989. The result on the probability of nursing home entry supports the hypothesis that whites may have more economic resources to afford institutional care than do non-whites (Table 3-1-1). The negative coefficient on the risk of mortality in the first period supports the hypothesis that white persons are more likely to survive longer because they have better access to health care than non-whites, so that whites might be placed in facilities far more often than non-whites. However, the significantly positive coefficient in the second period does not support this hypothesis (Table 3-1-2). Based on the hypothesis that whites will survive longer than other races, one possible explanation for this is that being white in the second period indicates being older than non-whites. Therefore, the older, the more the mortality risk.

Being male (MALE) makes a nursing home admission more likely, which is consistent with the hypothesis (discussed on p.110), but it is not statistically significant (Table 3-1-1). However, MALE has a significant positive effect on the risk of mortality in the community (Table 3-1-2). This reflects the difference in life expectancy at older ages between males and females in the United States.

The age variable (AGE) has a significant positive effect on both risks of nursing home entry and death in the community in both periods. This supports the hypothesis that an individual's health stock decreases with age. Therefore, the probabilities of nursing home entry and death are higher with aging.

Third, the indicator of previous medical care utilization (PRIHOSP) has a significant positive effect on both risks of nursing home entry, in 1982-1984, and mortality in the community, in both periods. The risk of nursing home entry is 29.8~31.4% higher if an elderly person was hospitalized before the first interview of the 1982 NLTCS. Also, the likelihood of death is about 57% and 87% higher if an elderly person stayed in a hospital overnight within one year before the interview in 1982 and 1984, respectively. This result supports the hypothesis that the previous hospitalization is an indicator of the severity of an individual illness for the impaired elderly, rather than a measure of "gross investment" in his or her health stock.

URBAN, indicating the price of health care inputs, is negatively related to the risk of nursing home entry, which supports the hypothesis, but it is not statistically significant in either period.

Finally, I would like to discuss potential economic resources of the elderly to afford facility care. Elderly individuals' asset income has a significant positive effect on the likelihood of nursing home entry from the community in Model I, during the first period. On the other hand, the effect of LOG_ASST on the mortality is significantly negative only during the second period. Table 3-1-1 shows that a unit increase in the log of annual asset income raises the risk of nursing home entry by 2.4%; that is equivalent to an approximate asset income elasticity of 0.02. Thus, a 10 % increase in annual asset income would increase the hazard of nursing home use by 0.2%. This supports the result obtained by Hanley et al. (1990). They found the disabled elderly with asset income (interests and dividends) have a higher probability of nursing home entry by 3.0 % than those without asset income (however the impact is much smaller than the estimation). This result suggests that the greater economic resources indicate the higher level of health status desired and more demand for facility care. Table 3-1-2 shows that a unit increase in the log of annual asset income decreases the risk of mortality by 10%, implying that the more asset an elderly has, the better health status.

OWNHOME has a negative effect on the risk of nursing home entry in the community, which is consistent with the hypothesis, and it is statistically significant only in 1984-1989 (Table 3-1-1). The risk of nursing home admission decreases by

35% if an elderly person is a homeowner. The older a person is, the more important factor to make a decision for nursing home care use OWNHOME is. Those who own home are more likely to die in the community, which is statistically significant in both study periods (Table 3-1-2). One possible explanation is that, since the elderly who own their home do not qualify for Medicaid, most of them will face the risk of "spend-down" if they enter a nursing home, and they wish to avoid selling their home. Therefore, home owners are more likely to die without going to a nursing home.

Table 3-8 shows the summary statistics of hazard rates; and survival probabilities for total population, for those who enter a nursing home, and for those who die in the community, with mean characteristics at different lengths of stay in the community and in a nursing home. These results are calculated based on Model II from regression estimates with Weibull distribution in Appendix tables 1-1-1, 1-1-2, 1-2-1, and 1-2-2.

In 1982-1984, the probability that those whose characteristics equal the mean will not have used a nursing home after 24 months is 0.915, implying that about 92% of those who survive for 24 months will not have used a nursing home (see the second column in Table 3-8). Similarly, in this period, the probability that elderly persons with average characteristics will not die after 24 months is 85.2% (see the third column in Table 3-8). Therefore, the total survival probability after 24 months, indicating the probability that the elderly will neither admit a nursing home nor die in the community, is 78.0% (see the fourth column in the Table 3-8). The total survival probability can be calculated from multiplying the survival probability for nursing home admission by the one for death in the community. In 1984-1989, the probability that those whose characteristics equal the mean will not have used a nursing home after 82 months is 0.778, implying that about 77.8% of those who survive for 82 months will not have used a nursing home (see the sixth column in Table 3-8). Similarly, in this period, the probability that elderly persons with average characteristics will not die after 82 months is 98.3% (see the seventh column in Table 3-8). Therefore, the total survival probability after 82 months is 76.5% (see the eighth column in the Table 3-8).

On the other hand, in 1982-1984, the probability that the average elderly who are living in a nursing home will not be discharged from a nursing home to the community after 24 months is 53.7% (see the tenth column in Table 3-8); the probability that the elderly living in a facility will not die after 24 months is 63.9% (see the eleventh column in Table 3-8); and the total survival probability is 34.4% (see the twelfth column in Table 3-8). In 1984-1989, the probability that the average elderly who are living in a nursing home will not be discharged from a nursing home to the community after 82 months is 96.1% (see the fourteenth column in Table 3-8) and, since there are no observations who died in a facility in this period, the total survival probability that the elderly living in a facility will neither be discharged nor die after 82 months is also 96.1% (see the sixteenth column in Table 3-8). These results are also shown in four Figures, 3-1-1, 3-1-2, 3-2-1, and 3-2-2. Compared with the risks in the community, the hazard rate for both nursing home discharge and mortality in a nursing home are much higher in the first few months than they are in the community. In the first study period, while the hazard rate of transferring from nursing home to other statuses is 0.042 in the first two months, it falls quickly to less than 0.027 after six months and to 0.020 by the end of the first year. This suggests that most nursing home users are short-stay residents; however, the rest of them are likely to stay for a long time (Liu et al. 1989). There is a binomial distribution, that is, in the first few months, the risks of discharge from nursing homes and death in nursing homes are much higher than entry into nursing homes from the community and death in the community in 1982-1984.

With regard to the risk of nursing home entry, I recalculate the survival probabilities by changing one characteristic, holding all other characteristics at the mean, in order to investigate how state Medicaid policies and limitations in ADLs and IADLs affect the survival probabilities for elderly persons with mean characteristics. Among state Medicaid policies, I chose M_NEEDY and H_WAIVER, whose effects on the risk of nursing home entry are statistically significant in the regression results. Table 3-9 and Figures from 3-3-1 through 3-5-2 show the results of this recalculation. Focusing on the risk of nursing home entry in the competing risks framework, both those who stay in the community without failure and those who died during the survey period are treated as censored, or as survivors from the hazard of nursing home entry. This calculation is statistically meaningful because I assume that the probabilities of a nursing home entry and death are independent, conditional on individuals' physiological characteristics, which are nonrandom. However, in the real world, this is important only if the disabled elderly prefer staying in the community as independently as possible (Kemper 1992) and, thus, if they would like to die in their household without going to a nursing home (this is apparently what is preferred).

Medicaid coverage programs for medically needy elderly has a strong impact on the survival probabilities in the community in the long-run. In 1982-1984, the probability that those living in states with a medically needy program will not have entered a nursing home in 24 months is 0.907; the comparable probability for elderly persons living in states without this program is 0.926 (see the second and third columns in Table 3-9). In contrast, in 1984-1989, the survival probability that those living in states with M_NEEDY will not have entered a nursing home in 82 months is 0.756; and the comparable probability for elderly persons living in states without M_NEEDY is 0.806 (see the eleventh and twelfth columns in Table 3-9). Therefore, we may conclude that Medicaid coverage programs for medically needy elderly has a more material effect on the likelihood of an individuals' nursing home admission in the long-run than in the short-run (also shown in Figures 3-3-1 and 3-3-2).

The survival probability of the elderly living in states with a Medicaid formal home care program is higher (0.919 and 0.779, after 24 months and after 82 months from the day of interview in each 1982 and 1984) than without this program (0.902 and 0.774) (see the third, fourth, thirteenth, and fourteenth columns in Table 3-9). However, the effect of H_WAIVER on the likelihood of nursing home admission is not large as much as M_NEEDY in both periods (also shown in Figures 3-4-1 and 3-4-2).

I find also that limitations in ADLs and IADLs have powerful influences on the survival probabilities. Table 3-9 show that the greater the number of limitations in ADLs, the less is the survival probabilities for those who enter a nursing home. The probabilities that those who are dependent in only one ADL, three ADLs, and all five ADLs; and any IADLs, will not have been institutionalized within a) 24 months; and b) 82 months after the day of the interview in 1982 and 1984, are a) 0.912, 0.864, 0.839, and 0.906; and b) 0.764, 0.708, 0.666, and 0.774, respectively (see Table 3-9 and Figures 3-5-1 and 3-5-2).

1-1-2. Transition probabilities from a nursing home to the community or death (Tables 3-2-1 and 3-2-2)

Fewer coefficients from my estimation of the risks of nursing home discharge and mortality in a nursing home has statistically significant effects than is true for my estimation of the risks in the community (Tables 3-2-1 and 3-2-2). There are two possible explanations. One possible explanation is that the data are biased because most observations were lost since very few elderly utilized nursing home care during both survey periods between 1982 and 1984; and between 1984-1989. An alternative explanation is that an individual's characteristics were not measured when he or she actually was admitted to a nursing home. Instead, I used an individual's characteristics at the first interview in 1982 and 1984 for estimation. Not only age, but also health, income, and household characteristics may have changed between the time when a sample person was interviewed and when he or she entered a nursing home. Besides, since there are no observations available for the mortality risk in a nursing home during the second study period (1984-1989), the regression results of this period are not trustworthy enough. In this section, therefore, I discuss the transition probabilities from a nursing home to other statuses only in the first period.

However, the effects of AGE, SENILE, LUNG, URBAN, and LOG_ASST on the risk of nursing home admission; and the influences of AGE, CANCER, and NEUROL on the risk of mortality in a nursing home are statistically significant. URBAN has a significant positive effect on the risk of nursing home discharge. Those who are demented are less likely to be discharged from a nursing home to the community, while those who have lung diseases and who are living in urban areas are more likely to be discharged. Even if elderly persons are discharged from a nursing home, those living in urban areas might more easily access medical services and public networks such as social services than in rural areas. Thus, the risk of nursing home discharge is higher for those living in urban areas than in rural areas. With regard to the risk of death in a nursing home, those who are older and who have cancer are more likely to die in a nursing home, while those who have multiple sclerosis, cerebral palsy, epilepsy, or Parkinson's disorder are less likely to die there.

There is an interesting result from estimating the risk of mortality in a nursing home, using the parametric approaches and assuming that the basic hazard is distributed as either Weibull or exponential. Based on these two approaches, M_NEEDY has a significant positive effect on the probability of death in a nursing home (Appendix tables 1-2-2 and 2-2-2). This suggests that, among nursing home patients, those who are living in a state which has a "medically needy" program are more likely to die in a nursing home than those who are not. A "medically needy" program will motivate seriously ill elderly persons who do not receive SSI payments, but who lack the resources to purchase nursing home care, to utilize institutional care. However, if other estimation methods are used, the effect of M_NEEDY is not statistically significant, and, thus, is not trustworthy.

1-1-3. Transition probabilities from the community to a nursing home or death in 1982-1989 as a single-period, using explanatory variables measured in 1982 (Tables 3-5)

Based on the assumption that explanatory variables are time-invariant during the study period, I treat the period between the interviews of the 1982 and 1989 NLTCS as a single period, using an individual characteristics in 1982 as independent variables. Of 5,795 sample persons, therefore, 1,248 were lost because of the same reasons as the study on the transition probabilities in the community between 1982 and 1984. In addition, for those neither who entered a nursing home nor who died in the community in this period (3,170 persons), 1,422 were lost because I was unable to follow their status to obtain length of stay in that status after the interview in 1984. As results, I use 3,125 for the analysis of transition from the community to other statuses between 1982 and 1989. Out of the 3,125 elderly, 815 individuals had entered a nursing home (2,310 (73.9%) who stay in the community plus those who died without going to a nursing home during the study period are treated as censored, for estimating the risk of nursing home entry); and 857 had died without going to a nursing home (2,268 (72.6%) which includes those who stay in the community without dying plus those who entered a nursing home during the survey period are censored, for estimating the risk of mortality in the community). For estimating the likelihoods of nursing home discharge and mortality in a nursing home from 1982 through 1989, we need observations who were in nursing homes (censored) at the end of the first period (or, the start of the second period), regardless of the assumption that an individual characteristics are time invariant or varying. However, there are not enough observations for econometric analysis to estimate these likelihoods in a nursing home. Therefore, I estimate only the probabilities of nursing home entry and mortality in the community for the period 1982-1989[2].

I found almost consistent results to the single-period models discussed in the previous section. Most importantly, M_NEEDY increases the risk of nursing home entry by 25.4%. Among all models for three study periods, 1982-1984, 1984-1989, and 1982-1989, assumed that explanatory variables are time-independent, both the directions and sizes of the influence of M_NEEDY on the probability of nursing home admission are consistent. In this study period, despite, H_WAIVER are not statistically significant and LG_PRICE has a significant negative effect on the likelihood of institutionalization only in Model II. Table 3-5 shows that the approximate own-price elasticity of nursing home care for private patients is -0.10, which means that a 50% increase in P_N would decrease the probability of out-of-

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[2] For those who were staying in a nursing home at the start of the second period (1984-1989), the number of months I was able to calculate is only 38.

pocket patients' nursing home use by 5.0%, in 1982-1989. In the long-run, therefore, an elderly person's demand for facility care is less responsive to the price.

With regard to PAS1, I obtained the significant positive effect on the risk of institutionalization, suggesting that the presence of prescreening program for those who would eligible immediately on the nursing home admission increases the probability of an elderly person's nursing home use by 18.1% (Table 3-5). This result is consistent with the former findings by Scanlon (1980) and Liu et al. (1991); however, it is contrary to anyone's hypotheses that the prescreening program may restrict the demand for nursing home care. Therefore, they conclude that because of the variation in the PAS programs among states, interpretation of this result is difficult. Regardless, this result is not statistically consistent among the study periods.

For the risk of mortality in the community in this study period, both MEDLGRAT and MEDLGBED have significant positive and negative effects. The probability of death in the community increases by 41.3~78.9% due to a unit increase in the log value of Medicaid reimbursement rate and it decreases by 26.9% due to a unit increase in the log value of Medicaid-certified beds per 1,000 elderly persons. These results support the hypothesis based on the findings of Dusansky (1989). Higher Medicaid reimbursement rates will discourage a nursing home from distinguishing between private and Medicaid patients, which may cause a lower price for private patients. As results, under the assumption that the number of nursing home beds is restricted, the ratio of out-of-pocket patients to Medicaid patients in a nursing home will increase. In other words, higher Medicaid reimbursement rates will decrease the access of Medicaid patients to nursing home care, and may affect their health status negatively. The greater the number of Medicaid-certified beds, the more the accessibility to long-term care for elderly Medicaid beneficiaries, which may reduce the risk of mortality in the community.

Another important result from this approach are significant effects of both economic variables, LOG_ASST and OWNHOME, on the elderly's nursing home utilization. In both Models I and II, an unit increase in the log value of an elderly person's asset income over the average increases the probability of an individual's nursing home admission by approximately 3%, that is equivalent to an approximate asset income elasticity of 0.03. Thus, a 10 % increase in annual asset income would increase the hazard of nursing home use by 0.3%. The income elasticity is almost the same as the result obtained in Model I in the study period, 1982-1984. OWNHOME lowers the probability of a nursing home admission by 18.1~20.2%. I did not obtain a significant result on OWNHOME from two single-period models in the previous section. Therefore, whether a person owns a home or not may be a more important indicator in the long-term rather than the short-term.

Table 3-10 shows the summary statistics of hazard rates; and survival probabilities for total population, for those who enter a nursing home, and for those who die in the community, with mean characteristics at different lengths of stay in the community and in a nursing home, in the study period, 1982-1989. These results are calculated based on Model II from regression estimates with Weibull distribution in Appendix tables 1-3.

In 1982-1989, the probability that those whose characteristics equal the mean will not have used a nursing home after 96 months is 0.595, implying that about 59.5% of those who survive for 96 months will not have used a nursing home (see the second column in Table 3-10). Similarly, in this period, the probability that elderly persons with average characteristics will not die after 96 months is 67.3% (see the third column in Table 3-10). Therefore, the total survival probability after 96 months, indicating the probability that the elderly will neither admit a nursing home nor die in the community, is 40% (see the fourth column in the Table 3-10). These results are also shown in Figure 3-6. Figure 3-6 shows that, after 64 months, the survival probability for the mortality risk becomes higher than the one for the nursing home entry risk. Those who survive without admitting a nursing home or dying in the community in 64 months will face the higher risk of institutionalization than death in the community.

With regard to the risk of nursing home entry, I recalculate the survival probabilities by changing one characteristic, holding all other characteristics at the mean, in order to investigate how state Medicaid policies and limitations in ADLs and IADLs affect the survival probabilities for elderly persons with mean characteristics. Among state Medicaid policies, I chose M_NEEDY, H_WAIVER, and PAS1 whose effects on the risk of nursing home entry are statistically significant in the regression results. Table 3-11 and Figures from 3-7 through 3-10 show the results of this recalculation.

Medicaid coverage programs for medically needy elderly has a strong impact on the survival probabilities in the community in the long-run. In 1982-1989, the probability that those living in states with a medically needy program will not have entered a nursing home in 96 months is 0.563; the comparable probability for elderly persons living in states without this program is 0.641 (see the second and third columns in Table 3-11). This is also shown in Figure 3-7.

The survival probability of the elderly living in states with a Medicaid formal home care program is higher (0.603 after 96 months from the day of interview in 1982) than without this program (0.568) (see the fourth and fifth columns in Table 3-11). However, the effect of H_WAIVER on the likelihood of nursing home admission is not large as much as M_NEEDY in this study period (also shown in Figure 3-8).

The survival probability of the elderly living in states with a PAS1 is lower (0.572 after 96 months from the day of interview in 1982) than without this program (0.626) (see the sixth and seventh columns in Table 3-11). The effect of PAS1 on the likelihood of nursing home admission is large almost as much as M_NEEDY in this study period (also shown in Figure 3-9).

I find that limitations in ADLs and IADLs have powerful influences on the survival probabilities (except for ADL1). Table 3-11 show that the greater the number of limitations in ADLs, the less is the survival probabilities for those who enter a nursing home. The probabilities that those who are dependent in only one ADL, three ADLs, and all five ADLs; and any IADLs, will not have been institutionalized within 96 months after the day of the interview in 1982 are 0.591, 0.516, 0.419, and 0.569, respectively (see Table 3-11 and Figure 3-10).

1-2. Heterogeneity

In this section, I would like to show the results from a parametric approach assuming that the basic hazard has a Weibull-gamma distribution, which permits us to measure the effect of unobserved heterogeneity. Tables 3-3-1, 3-3-2, 3-4-1, and 3-4-2 show the regression results. In these tables, the parameter, θ, shows the size of effect of unobservable factors on the results based on Cox proportional hazard estimations. The Cox proportional hazard model assumes that the survival distribution across individuals are homogeneous. This assumption may misspecify regression results if there exits heterogeneity among the survival distributions across sample persons. The further deviates of θ in these tables from 0 (in either direction, negative or positive) can be interpreted as the greater effect of the heterogeneity.

As results, the influence of unobserved heterogeneity on transition probabilities from the community to a nursing home is larger, in general, than the risk of mortality in the community. The values of θ are 1.89~2.06 and 0.94~0.96 for the risk of a nursing home admission; and 0.16~0.19 and 0.74~0.75 for the risk of mortality in the community, in 1982-1984 and 1984-1989, respectively. Furthermore, in both study periods, the effects of heterogeneity on transition probability from a nursing home to other statuses are extensive, except for the Model II estimating the likelihood of a nursing home discharge in the first study period. In each period, 1982-

1984 and 1984-1989, the values of θ are 6.8 and 10.2~11.5 for the risk of a nursing home discharge. And, the value for the risk of death in a nursing home in 1982-1984 is 17.6~18.2. As I noted in the previous section, the possible explanation is that the estimation is based on an individual's characteristics not at the time of admission, but at the first interview in 1982 and 1984. They may have changed between the time of the interview and the time of entry into a nursing home. The effect of heterogeneity is the smallest for estimation of the risk of death in the community. Therefore, the mortality risk in the community is fit the most the assumption of the Cox-proportional model.

The most important results from this parametric approach are significant effects of Medicaid reimbursement rates (MEDLGRAT) and the number of Medicaid-certified beds (MEDLGBED) on the risk of mortality of the elderly who are on Medicaid in the community, in the first study period (1982-1984). MEDLGRAT and MEDLGBED have significant positive and negative, respectively, effects on the likelihood of Medicaid recipients' mortality in the community in Model II (Table 3-3-2). These results support the hypothesis based on the findings of Dusansky (1989). Higher Medicaid reimbursement rates will discourage a nursing home from distinguishing between private and Medicaid patients, which may cause a lower price for private patients. As results, under the assumption that the number of nursing home beds is restricted, the ratio of out-of-pocket patients to Medicaid patients in a nursing home will increase. In other words, higher Medicaid reimbursement rates will decrease the access of Medicaid patients to nursing home care, and may affect their health status negatively. The greater the number of Medicaid-certified beds, the more the accessibility to long-term care for elderly Medicaid beneficiaries, which may reduce the risk of mortality in the community. These results are consistent with the regression results of Model I, but they are not statistically significant. Likewise, neither effects of MEDLGRAT nor MEDLGBED on the mortality risk in the second study period is statistically significant.

I also show the results from a parametric approach assuming that the basic hazard has a Weibull-gamma distribution, in the study period 1982-1989 (Table 3-6). Compared with the influence of unobserved heterogeneity on transition probabilities from the community to a nursing home in the previous two single-period models, the values of θ are much smaller (-0.5). This suggests that the Cox-proportional estimation for the likelihood of a nursing home entry in 1982-1989 is the least influenced by unobserved heterogeneity across individuals, among three single-period models. On the other hand, the value of θ for the risk of mortality in this period is -0.54~-0.57. Therefore, the effect of heterogeneity for estimating the mortality risk in the community in the study period 1982-1984 is the smallest (0.16~0.19) among three single-period models.

2. Semi-parametric baseline hazard with time-varying covariates

In order to introduce individuals' time-varying characteristics into the analysis, I used the 1982, 1984, and 1989 NLTCS. The sample used for estimation had to include the elderly who had completed detailed questionnaires at least in 1982 and 1984, because an individual's characteristics in both periods - 1982-1984 and 1984-1989 - are used as time-varying explanatory variables for the regression. As I mentioned before, the sample size of persons who had completed both the 1982 and 1984 detailed questionnaires is 5,795. Out of these, I used 1,780 observations because of missing data on crucial variables. Here, I focused only on the transition probability from the community to a nursing home or death because not enough data on the length of nursing home stay in the second period are available for an econometric analysis. The length of stay in a nursing home in the second period could be obtained only for five observations. Table 3-7 shows regression results of the semi-parametric baseline hazard model with time-varying covariates.

For the dependent variables, in this study, I used the length of stay in the community in the first period if a person exits in that period; the added lengths of stay in the community in the first and second periods are used, if a person did not exit from the community (censored) in the first period. Table 2-6 summarizes all explanatory variables by time-independent and time-dependent covariates. State Medicaid policy variables are treated as constant because there had been no major change in state Medicaid policies by 1989. However, the proportion of Medicaid recipients in the sample of elderly persons living in the community had changed slightly between 1982 and 1984. The mean rate of Medicaid recipients increase from 0.268 to 0.311 during the survey years (Table 2-6). This slight change affects two Medicaid interaction terms, MEDLGRAT and MEDLGBED. I treated the following variables as being time-independent, M_NEEDY, H_WAIVER, PAS1, PAS2, WHITE, MALE, URBAN[3], and LOG_FINC.

The presence of a medically needy program increases the risk of nursing home entry by 29.5%. Thus, the impact of a medically needy program based on the regression with time-varying covariates is almost the same as the result of the regression with time-invariant covariates. In contrast, the effect of Medicaid coverage for community-based care (H_WAIVER) on the risk of nursing home entry becomes insignificant in this model.

Medicaid reimbursement rates (MEDLGRAT) and the number of Medicaid-certified nursing home beds (MEDLGBED) have significant effects on the hazard of nursing home entry of those who are on Medicaid. Controlling for a change in Medicaid eligible rate over time, a unit increase in the log of Medicaid reimbursement rate reduces the risk of a nursing home entry by 45.1% only in Model II; and the availability of a unit increase in the log of Medicaid certified beds over the average per 1,000 elderly persons increases the risk of institutionalization by 112.4% and 56.2%, in Model I and II, respectively, for those on Medicaid (Table 3-7). These results are consistent with my hypothesis. However, changes in MEDLGRAT and MEDLGBED over time are not caused by reimbursement rates and the number of Medicaid-certified beds, but they are affected by the Medicaid eligibility rate among the elderly. Therefore, these significant effects on the risk of a nursing home entry

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[3] The NLTCS dropped sample persons who move from one place to another in the community. Therefore, I can consider URBAN as a time-independent variable.

indicate that Medicaid has become important for the disabled elderly during the survey period. This may be also supported by the following result.

The important result is that MEDICAID has a significant negative effect on the risk of mortality in the community in Model I. Those who are on Medicaid face 100% less risk of mortality in two-year interval than elderly persons who are not on Medicaid. Medicaid has been increasing in significance for elderly persons' health status because of the increased prevalence of poverty among as shown by the figures for 1,985 sample elderly persons. For example, mean monthly income had dropped from $511.10 to $ 378.80 and mean annual asset income had fallen from $81.60 to $32.90 during the survey years. Also, the rate of home ownership among the elderly sample decreases from 0.568 to 0.306, or by 46.1%. In particular, among those who used nursing home care during the survey period, the rate of home ownership decreases from 0.481 to 0.157, or by 67.3% (Table 2-6). The alternative explanation for an increase in the significance of Medicaid for elderly persons health status is higher costs: for the US. elderly population medical care expenditure per capita increased from $1,186.10 to $1,396.68, or by 17.8%[4].

The results for the demographic variables are similar to what I found for the regression with time-invariant covariates, with respect to both the direction and the size of effects.

The effects of changes in individuals' chronic health status are more likely same as my findings in the single-period model, with respect to both the direction and

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[4] US Bureau of the Census, 1986, *Statistical Abstract of the United States*, Washington, D.C., Table 796.

the size of effects. However, the role of Medicaid in elderly persons' acute health status has been increasing in importance over time. Compared with the regression results with time-independent covariates in 1982-1984, however, the influences of limitations in ADLs and IADLs on the probability of a nursing home entry became statistically insignificant except for ADL2 and ADL5; and their effects on the mortality risk in the community became negative. This result shows that the risk of death in the community has been already predetermined by an individual's initial health stock, regardless of changes in health status. Furthermore, changes in chronic conditions may not be necessarily good indicators for measuring the level of health stock.

With regard to economic status, individuals' home ownership significantly reduces the likelihood of entering a nursing home from the community; and both LOG_FINC and LOG_ASST have significant effects on the mortality risk in the community, but the directions of their effects are opposite. First, OWNHOME lowers the probability of a nursing home admission by approximately 35%. As I noted above, the older and the more frail a person is, the higher the risk of losing one's home, because of "spend-down" for long-term care. This risk is unacceptable to most elderlies. Therefore, home ownership is an important factor when an elderly person is making a decision over long-term care. Second, while the mortality risk in the community increases by 10.5% due to a unit increase in the log of total family income over the average, it decreases by 36.2~40.2% as a unit increase in the log of an elderly person's asset income over the average. With regard to an individual's asset income, the result is consistent with the hypothesis that the more asset income a person owns, the better health status he or she can obtain, because LOG_ASST indicates the ability to pay for investment for the production of "healthy time" in the community. An increase in the total family income is expected to have a positive effect on an elderly person's health stock and a negative impact on his or her mortality risk in the community, because it can be interpreted as an increase in potential economic resources to afford both medical and long-term care. Therefore, the result is inconsistent with the hypothesis. Based on the hypothesis that those who have more family income can survive longer than those who have less because of the positive impact on an individual health stock, one possible interpretation for this result is that a more family income indicates being older than the poorer. Therefore, the older, the more the mortality risk.

3. Summary and direction of further research

In the first part of this study, a competing-risks model was used to investigate the roles of both state Medicaid policy variables and an elderly person's initial health stock in determining (i) the likelihood of nursing home entry and discharge, and (ii) the likelihood of mortality in the community and in a nursing home, for three study periods, 1982-1984, 1984-1989, and 1982-1989, separately. Second, I examined the effect of unobserved heterogeneity on the model. Third, I extended the regression form of a semi-parametric hazard model to a model with time-varying covariates, which allows independent variables to vary over time. Based on this empirical work, I found the following results.

Some public support to an elderly person could materially affect his or her input price for long-term care. The presence of a medically needy program (M_NEEDY) increases an elderly persons' risk of institutionalization by about 30% over the risk without this program because it lowers the self-pay input price of nursing home care for the patients who face a high risk of "spend-down". In contrast, Medicaid coverage for community-based care (H_WAIVER) decreases the hazard of nursing home entry by 19.1 % because of an increase in the price of institutional care relative to formal paid community-based care, if the price of nursing home care is held constant. The presence of Medicaid coverage for community-based care and a larger number of potential caregivers have the same significant negative effects on the opportunity cost of informal caregivers and thus, the likelihood of nursing home admission, suggesting that nursing home care (C_N) and either informal services (C_I) or formal home care (C_F) are substitutes in the health production function. These results are very important for policy makers because policy emphasis on formal and informal community-based care may control input prices of long-term care, and thus, it reduce individuals' probability of nursing home care utilization. However, I have to note that, while the effect of M_NEEDY on the probability of an elderly person's nursing home use is significant and consistent among all regression models, the influence of H_WAIVER is significant only in the study period 1982-1984 and the size of the effect is not large as much as M_NEEDY.

During the study period, 1984-1989, both effects of MEDLGRAT and MEDLGBED on a person's nursing home use are statistically significant. A unit increase in the log value of Medicaid reimbursement rates will decrease an individual's nursing home use by 45.4% in Model II; and more Medicaid-certified beds will increase it in both Models I and II (Table 3-1-1). However, note that the significance and size of these variables varies among the survey periods.

The result confirm that the elderly living in states with a more generous Medicaid policy for institutional care are more likely to use nursing home care. In contrast, it is true that those living in states which make efforts to increase social capacity to support the elderly in the community as independently as possible are less likely to use institutional care. The presence of a medically needy program and the number of Medicaid-certified nursing home beds are the most appropriate indicators to measure the degree of state generosity for facility care. However, Table 2-1 shows that states with a Medicaid coverage program for home care have fewer Medicaid-certified beds (-0.179). It suggests that state philosophy under a public budget constraint could affect an individual's behavior regarding long-term care since the utilization of nursing home care is sensitive to changes in the input prices of formal and informal community-based care.

Using the average weekly wage for Intermediate Care Facilities (ICF) in each state as a proxy for the nursing home price for private-pay patients, Table 3-1-1 shows that the approximate own-price elasticity of nursing home care for private patients is -0.15 and -0.07, which means that a 50% increase in P_N would decrease the probability of out-of-pocket patients' nursing home use by 7.5% and 3.5%, in each period, 1982-1984 and 1984-1989. The difference of own-price elasticities of nursing home care for private patients between two study periods may be due to a change in elderly person's preference for facility care. The older, the less responsive to the price of institutional care.

An individual's initial health stock at the first interview in the 1982 and 1984 NLTCS, serving as a proxy for the level of the unobservable "stable health" condition desired, has a significant effect on both the probability of nursing home admission and that of death in the community. With regard to ADLs, the greater the number of limitations in ADLs, the higher the probability of nursing home entry. The more sever the limitations in ADLs, the higher the probability of nursing home admission, and thus, the less the probability of surviving in the community. Medical conditions also have significant positive effects on the risk of a nursing home entry: however, LUNG has a negative impact, and, those who have lung diseases are more likely to be discharged from a nursing home. This might be caused by either discrimination against patients with contagious lung diseases. But, among those who had lung diseases, more than half had emphysema and/or asthma, which are not contagious. Moreover, pneumonia and bronchitis are curable diseases. Therefore, a possible explanation for the negative effect of LUNG on the probability of nursing home admissions is that nursing home do not have special facilities such as a respirator to provide intensive medical care for those who have advanced lung diseases.

The transition probabilities from a nursing home to other statuses are not well determined by this model. There are two possible explanations. The one is that the data might be biased because most observations were lost since very few elderly utilized nursing home care during both survey periods between 1982 and 1984; and 1984 and 1989. An alternative explanation is that an individual's characteristics were not measured at the time of admission to a nursing home. Instead, I used an individual's characteristics at the first interview in 1982 and 1984 for estimation. They may have changed between the time of the interview and entry into a nursing home. This would also explain why the effect of heterogeneity on this model is very large.

The likelihoods of mortality in the community in both 1982-1984 and 1984-1989 survey periods are less influenced by unobserved heterogeneity than the probabilities of a nursing home admission. This shows that, for the risk of mortality in the community, the elderly population could be treated as being homogeneous, while tastes for nursing home care vary across individuals. The "tastes" for death could not be very different across individuals. Besides, I assume that the status of death is predetermined to an individual, because of conditional on his or her physiological characteristics which are difficult to be controlled statistically. In the long-run (1982-1989), however, the size of heterogeneity is not much different among the two risks in the community (Table 3-6).

The most important results from the Weibull-Gamma approach are significant effects of MEDLGRAT and MEDLGBED on the risk of mortality for the elderly who are on Medicaid in the community, in the survey period, 1982-1984. Furthermore, in the study period, 1982-1989, these variables are statistically significant in both the Cox-proportional and Weibull-gamma models. This is the evidence some state Medicaid policies will affect an elderly person's health status.

When time-varying covariates are taken into account, the effect of a medically needy program on the risk of nursing home admission is almost the same as the one in the model without time-invariant covariates. In the model with time-dependent variables, the role of Medicaid in elderly persons' acute health status has been increasing in importance over time, consistent with the increase in poverty among sample persons, or the use in health care costs, or both.

Reducing elderly persons' risks of institutionalization could control the growth in public expenditures on nursing home care. However, restrictive public policies on facility care, e.g., reducing the supply of Medicaid-certified beds, are not necessarily effective for lowering the utilization of nursing home care not only because they do not have significant effects on the probability of admission but also because they could negatively affect the health status of the elderly. In particular, because of an increase in the depreciation rate of elderly persons' health stock and the prevalence of poverty among the elderly over time, the role of public policies has been growing in importance. Hence, the restriction on Medicaid policies would reduce access, especially of the poor, to long-term care and might accelerate the depreciation of their health stock. Finally, this could increase the total amount of caregiving time demanded in the community and so could raise the input price of home care relative to nursing home care. On the other hand, a state Medicaid policy such as coverage for community-based care will help reduce the hazard of nursing home entry and will assist elderly persons to live in the community as independently as possible, through its effects on each individual's input price of home care. Also, involving informal caregivers as much as possible will help reduce the risk of nursing home use. But while considering informal caregivers as an important "human capital" to produce elderly persons' time in the community, we also have to think not only about caregivers' opportunity costs but also about the physical and mental costs they incur when taking care of elderly persons.

There are three possible directions for further research. First, since I do not have exact nursing home prices for private-pay patients by states, I cannot directly discuss the demand for nursing home care. Second, with respect to the estimation method, even if the state of death is usually considered as an "absorbing" state (because no possible transitions occur from the state of death), it is still possible that two risks, e.g., the risks of nursing home entry and mortality in the community, are interdependent. For example, since the utilization of nursing home care is considered as an investment to mitigate the effect of health stock depreciation, it may lower the risks of elderly persons' mortality in the community. Finally, when the 1994 NLTCS becomes available to the public, we can do a more complete analysis of how the major change in state Medicaid policy enacted in 1989 affected the likelihood of nursing home use.

TABLE 1-1: NUMBERS AND PERCENTS OF ELDERLY (65 AND OVER) PERSONS SERVED (a/) BY HOSPITAL INSURANCE UNDER MEDICARE, BY TYPE OF SERVICE: 1975-1992

Year	Total number of persons b/ served by hospital insurance under Medicare	Skilled nursing home care		Home health services c/		Ratio of home health to skilled nursing home care beneficiaries
		Number	Percent	Number	Percent	
1975	4,963,000	260,000	5.2	329,000	6.6	1.3
1980	6,024,000	248,000	4.1	675,000	11.2	2.7
1985	6,058,000	304,000	5.0	1,448,000	23.9	4.8
1986	6,018,000	294,000	4.9	1,469,000	24.4	5.0
1987	6,048,000	283,000	4.7	1,447,000	23.9	5.1
1988	6,082,000	371,000	6.1	1,485,000	24.4	4.0
1989	6,155,000	613,000	10.0	1,580,000	25.7	2.6
1990	6,367,000	615,000	9.7	1,818,000	28.6	3.0
1991	6,576,000	648,000	9.9	2,082,000	31.7	3.2
1992	6,746,000	759,000	11.3	2,357,000	34.9	3.1

Source: US Department of Commerce, Economics and Statistics Administrations, Bureau of the Census, 1990, 1991, 1992, 1993, 1994, and 1995, Statistical Abstract of the United States, Washington, D.C..

Notes:

a/ Persons served are enrollees who use covered services, who incurred expenses greater than the applicable deductible amounts and for whom Medicare paid benefits.

b/ Persons are counted once for each type of covered service used, but are not double counted in totals.

c/ Home health care is provided to individuals and families in their place of residence. Beginning 1982, a change in legislation resulted in virtually all home health services being paid under hospital insurance.

TABLE 1-2: PERSONAL HEALTH CARE EXPENDITURE (a/) BY OBJECT AND SOURCE OF PAYMENT [IN MILLION OF DOLLARS: 1993]

	Total		Nursing home care		Home health services b/	
	Amount ($)	Percent	Amount ($)	Percent	Amount ($)	Percent
Total	782,513	100	69,621	100	20,781	100
Out of pocket payment	157,466	20.1	22,969	33.0	4,332	20.8
Third party payment total	625,047	79.9	46,652	67.0	16,449	79.2
Private health insurance	258,050	33.0	1,739	2.5	2,540	12.2
Government	337,033	43.1	43,612	62.6	11,381	54.8
Other c/	29,965	3.8	1,301	1.9	2,528	12.2

Source: US Department of Commerce, Economics and Statistics Administrations, Bureau of the Census, 1995, Statistical Abstract of the United States, Washington, D.C., Table No. 158.

Notes:
a/ Includes Puerto Rico and outlying areas. Covers all expenditures for health services and supplies, except net cost of insurance and administration, government public health activities, and expenditures of philanthropic agencies for fund raising activities.
b/ Home health care is provided to individuals and families in their place of residence. Beginning 1982, a change in legislation resulted in virtually all home health services being paid under hospital insurance.
c/ Includes nonpatient revenues and industrial plant.

TABLE 1-3: ELIGIBILITY FOR MEDICAID COVERAGE: October 1, 1982

Eligibility criteria for

Categorically needy	Medically needy
-Aged, blind, disabled, or member of family unit deprived of support of parent -Income standard -Resource standard	-Member of categorically related group -Income standard met or income more than allowed but medical expenses incurred are at least equal to the difference between income and the applicable income standard -Resource standard

AFDC		SSI			
Populations for which coverage is:				Populations for which coverage is:	
Mandatory	Optional	Mandatory	Optional	Mandatory	Optional
-Individuals receiving AFDC payments	-Individuals eligible for but not receiving assistance	-Individuals receiving SSI payments	-Individuals eligible for but not receiving cash assistance	-All pregnant women during the course of their pregnancy	-Caretaker relatives -Aged -Blind -Disabled
-Families terminated from AFDC because of increased earning or hours of employment	-Individuals who would be eligible for cash assistance except for institutional status	-Individuals in States using more restrictive requirements for Medicaid than SSI	-Individuals who would be eligible for cash assistance except for institutional status	-All individuals, or reasonable classifications of those individuals, under age 21	-Aged, blind, and disabled in States imposing more restrictive eligibility requirements than SSI income
-Individuals ineligible for AFDC because of requirements that do not apply under Title XIX of the Social Security Act	-Individuals who would be eligible if child care costs were paid from earnings	-Individuals ineligible because of requirements that do not apply under Medicaid	-Individuals who would be eligible for AFDC if child care costs were paid from earnings	-Blind and disabled individuals eligible in Dec. 1973	

Table 1-3 - Continued

Eligibility criteria for

Categorically needy				Medically needy
AFDC		SSI		Populations for which coverage is:
Populations for which coverage is:				
Mandatory	Optional	Mandatory	Optional	Mandatory
-Individuals who would be eligible for AFDC except for increased OASDI income under Public Law 92-336 of July 1, 1972.	-Individuals under 21 who should be eligible for AFDC but do not qualify as dependent children	-Individuals receiving mandatory State supplements	-Individuals receiving only optional State supplements	
-Children for whom adoption assistance or foster care maintenance payments are made under Title IV-E of the Social Security Act	-Individuals who would be eligible if coverage under State's AFDC plan were as broad as allowed under Title IV-A of the Social Security Act	-Individuals who in Dec.1973 were eligible for Medicaid as an essential spouse and who have continued to live with and be essential to the well-being of a recipient of cash assistance.	-Individuals in institutions who are eligible under a special income level	
		-Institutionalized individuals eligible in Dec. 1973.		
		-Blind and disabled individuals eligible in Dec. 1973.	-Individuals receiving home- and community-based services who are eligible under a special income level	

Table 1-3 - Continued

Eligibility criteria for

Categorically needy				Medically needy	
AFDC		SSI		Populations for which coverage is:	
Populations for which coverage is:					
Mandatory	Optional	Mandatory	Optional	Mandatory	Optional
		-Individuals who would be eligible except for the increase in OASDI benefits under Public Law 92-336 of July 1, 1972 -Individuals who (a) become ineligible for cash assistance as a result of OASDI cost-of-living increases received after April, 1977; and (b) who would still be eligible for SSI SSP if those increases were deducted from income			

Sources: US Department of Health and Human Services, June 1986, Health Care Financing Program Statistics, Medicare and Medicaid Data Book, 1984, Baltimore, Maryland, pp. 58-63, Figures 4.1 and 4.2.

US Department of Health and Human Services, 1995, Health Care Financing Review, 1995 Statistical Supplements, Baltimore, Maryland, pp. 118-123.

Notes:
AFDC = Aid to Families with Dependent Children
SSI = Supplemental Security Income
OASDI = Old Age, Survivors, and Disability Insurance
SSP = State Supplement Payments

TABLE 1-4: NUMBERS AND PERCENTS OF ELDERLY USERS OF MEDICAID, BY TYPE OF SERVICE [IN THOUSANDS: 1975-1993]

Year	Total a/	Inpatient hospital	ICF/MR	Nursing facility b/	Physician	Outpatient hospital	Home health	Prescription drugs
	Number (%)	Number (%)	Number (%)	Number (%)	Number (%)	Number (%)	Number (%)	Number (%)
1975	3,615 (100)	757 (20.9)	2 (0.1)	1,023 (28.3)	2,263 (62.6)	732 (20.2)	115 (3.2)	2,673 (73.9)
1976	3,612 (100)	786 (21.8)	2 (0.1)	1,080 (29.9)	2,275 (63.0)	816 (22.6)	113 (3.1)	2,718 (75.2)
1977	3,636 (100)	824 (22.7)	2 (0.1)	1,112 (30.6)	2,338 (64.3)	828 (22.8)	134 (3.7)	2,678 (73.7)
1978	3,376 (100)	858 (25.4)	3 (0.1)	1,093 (32.4)	2,245 (66.5)	908 (26.9)	106 (3.1)	2,595 (76.9)
1979	3,364 (100)	798 (23.7)	3 (0.1)	1,080 (32.1)	2,222 (66.1)	874 (26.0)	56 (1.7)	2,504 (74.4)
1980	3,440 (100)	831 (24.2)	12(0.3)	1,095 (31.8)	2,221 (64.6)	903 (26.3)	108 (3.1)	2,524 (73.4)
1981	3,367(100)	843 (25.0)	9 (0.3)	1,134 (33.7)	2,208 (65.6)	895 (26.6)	102 (3.0)	2,655 (78.9)
1982	3,240 (100)	811 (25.0)	8 (0.2)	1,105 (34.1)	2,148 (66.3)	885 (27.3)	105 (3.2)	2,523 (77.9)
1983	3,372 (100)	881 (26.1)	8 (0.2)	1,186 (35.2)	2,265 (67.2)	1,088 (32.3)	207 (6.1)	2,526 (74.9)
1984	3,238 (100)	785 (24.2)	5 (0.2)	1,164 (35.9)	2,140 (66.1)	1,041 (32.1)	199 (6.1)	2,444 (75.5)
1985	3,061 (100)	728 (23.8)	7 (0.2)	1,171 (38.3)	2,166 (70.8)	804 (26.3)	234 (7.6)	2,400 (78.4)
1986	3,140 (100)	720 (22.9)	6 (0.2)	1,185 (37.7)	2,216 (70.6)	884 (28.2)	254 (8.1)	2,469 (78.6)
1987	3,224 (100)	725 (22.5)	6 (0.2)	1,206 (37.4)	2,239 (69.4)	912 (28.3)	277 (8.6)	2,490 (77.2)
1988	3,159 (100)	728 (23.0)	5 (0.2)	1,248 (39.5)	2,066 (65.4)	918 (29.1)	263 (8.3)	2,504 (79.3)
1989	3,132 (100)	720 (23.0)	5 (0.2)	1,227 (39.2)	1,989 (63.5)	940 (30.0)	264 (8.4)	2,471 (78.9)
1990	3,202 (100)	705 (22.0)	7 (0.2)	1,234 (38.5)	2,056 (64.2)	944 (29.5)	288 (9.0)	2,591 (80.9)
1991	3,341 (100)	759 (22.7)	8 (0.2)	1,265 (37.9)	2,185 (65.4)	1,049 (31.4)	300 (9.0)	2,727 (81.6)
1992	3,749 (100)	870 (23.2)	12 (0.3)	1,339 (35.7)	2,366 (63.1)	1,196 (31.9)	324 (8.7)	2,872 (76.6)
1993	3,863 (100)	909 (23.5)	10 (0.3)	1,370 (35.5)	2,569 (66.5)	1,335 (34.6)	356 (9.2)	2,954 (76.5)
				Average annual rate of change (percent)				
	0.3	1.0	6.9	1.6	0.7	3.4	6.5	0.6

TABLE 1-4 - Continued

Sources: US Department of Health and Human Services, Health Care Financing Review, 1995 Statistical Supplements, Baltimore, Maryland, pp.366-367, Table 109.
Health Care Financing Administration, "Statistical Report on Medical Care, Eligibles, Recipients, Payments, and Services" HCFA Form-2082.

Notes:
a/ The total includes users of all types of services reported on HCFA Form-2082. A person receiving multiple services (e.g., inpatient hospital, physician, and outpatient services) is included once in the user count for each type of service and once in the total.
b/ Data shown include services shown separately in earlier years as skilled nursing facility (SNF) and intermediate care facilities, other than for the mentally retarded (ICF-other). Beginning in fiscal year 1991, the conditions of participation for SNFs and ICF-Other were unified, the distinction between them was removed, and the services were renamed nursing facility services. It is possible that the combined number of recipients includes some persons who used both types of nursing facility care during the reported fiscal year. This could somewhat inflate the number of users and lower the average payments per recipient.

TABLE 1-5: MEDICAID PAYMENTS TO THE ELDERLY, BY TYPE OF SERVICE [IN MILLION OF DOLLARS: 1975-1993]

Year	Total a/	Inpatient hospital	ICF/MR	Nursing facility b/	Physician	Outpatient hospital	Home health	Prescription drugs
	Number (%)	Number (%)	Number (%)	Number (%)	Number (%)	Number (%)	Number (%)	Number (%)
1975	4,358 (100)	205 (4.7)	20 (0.5)	3,325 (76.3)	133 (3.1)	25 (0.6)	297 (6.8)	326 (7.5)
1976	4,910 (100)	244 (5.0)	18 (0.4)	3,594 (73.2)	147 (3.0)	34 (0.7)	364 (7.4)	453 (9.2)
1977	5,499 (100)	300 (5.5)	18 (0.3)	4,091 (74.4)	166 (3.0)	44 (0.8)	387 (7.0)	421 (7.7)
1978	6,308 (100)	382 (6.1)	29 (0.5)	4,755 (75.4)	174 (2.8)	44 (0.7)	410 (6.5)	429 (6.8)
1979	7,046 (100)	454 (6.4)	33 (0.5)	5,370 (76.2)	184 (2.6)	58 (0.8)	449 (6.4)	420 (6.0)
1980	8,739 (100)	806 (9.2)	199 (2.3)	6,288 (72.0)	225 (2.6)	67 (0.8)	519 (5.9)	433 (5.0)
1981	9,926 (100)	941 (9.5)	167 (1.7)	6,959 (70.1)	259 (2.6)	81 (0.8)	611 (6.2)	641 (6.5)
1982	10,739 (100)	1,006 (9.4)	95 (0.9)	7,674 (71.5)	247 (2.3)	90 (0.8)	629 (5.9)	688 (6.4)
1983	11,954 (100)	1,482 (12.4)	161 (1.3)	8,233 (68.9)	257 (2.1)	106 (0.9)	692 (5.8)	645 (5.4)
1984	12,815 (100)	1,396 (10.9)	106 (0.8)	8,649 (67.5)	255 (2.0)	110 (0.9)	763 (6.0)	1,085 (8.5)
1985	14 ,096(100)	1,450 (10.3)	175 (1.2)	9,409 (66.7)	264 (1.9)	105 (0.7)	883 (6.3)	1,171 (8.3)
1986	15,097 (100)	1,603 (10.6)	179 (1.2)	10,057 (66.6)	264 (1.7)	126 (0.8)	973 (6.4)	1,129 (7.5)
1987	16,037 (100)	1,375 (8.6)	226 (1.4)	10,667 (66.6)	249 (1.6)	145 (0.9)	1,075 (6.7)	1,298 (8.1)
1988	17,135 (100)	1,411 (8.2)	216 (1.3)	11,618 (67.8)	240 (1.4)	161 (0.9)	1,186 (6.9)	1,160 (6.8)
1989	18,558 (100)	1,263 (6.8)	264 (1.4)	12,559 (67.7)	272 (1.5)	181 (1.0)	1,282 (6.9)	1,296 (7.0)
1990	21,508 (100)	1,315 (6.1)	372 (1.7)	14,536 (67.6)	286 (1.3)	194 (0.9)	1,507 (7.0)	1,566 (7.3)
1991	25,444 (100)	1,634 (6.4)	430 (1.7)	17,121 (67.3)	343 (1.3)	255 (1.0)	1,823 (7.2)	1,812 (7.1)
1992	29,089 (100)	1,872 (6.4)	517 (1.8)	19,589 (67.3)	400 (1.4)	311 (1.1)	2,190 (7.5)	1,960 (6.7)
1993	31,554 (100)	2,023 (6.4)	590 (1.9)	21,191 (67.2)	489 (1.5)	406 (1.3)	2,441 (7.7)	2,046 (6.5)
				Average annual rate of change (percent)				
	11.2	12.4	12.8	9.1	6.7	12.8	20.0	11.8

TABLE 1-5 - Continued

Sources: US Department of Health and Human Services, Health Care Financing Review, 1995 Statistical Supplements, Baltimore, Maryland, pp.383-384, Table 121.
Health Care Financing Administration, "Statistical Report on Medical Care, Eligibles, Recipients, Payments, and Services", HCFA Form-2082.

Notes:
a/ The total includes payments for all types of services reported on HCFA Form-2082, not just the eight types of services listed here. A person receiving multiple services (e.g., inpatient hospital, physician, and outpatient services) is included once in the user count for each type of service and once in the total.
b/ Data shown include services shown separately in earlier years as skilled nursing facility (SNF) and intermediate care facilities, other than for the mentally retarded (ICF-other). Beginning in fiscal year 1991, the conditions of participation for SNFs and ICF-Other were unified, the distinction between them was removed, and the services were renamed nursing facility services. It is possible that the combined number of recipients includes some persons who used both types of nursing facility care during the reported fiscal year. This could somewhat inflate the number of users and lower the average payments per recipient.

TABLE 1-6: STATE MEDICAID ELIGIBILITY FOR AND LIMITS ON MONTHLY INCOME AND RESOURCES FOR THE AGED SEEKING MEDICAID COVERAGE OF NURSING HOME CARE

State	Social Security Administration (SSA) area code	Area	Basic criteria for and administration of Medicaid eligibility for the aged who receive cash assistance a/ b/	Upper limits for aged persons seeking coverage of nursing home care	
				On monthly income for a/ c/ d/	On countable resources for e/
Alabama	01	South	SSI-F	$852.90	$1,800
Alaska	02	West	SSI-S	$1,200	$1,800
Arizona	03	West	SSI-F	-	-
Arkansas	04	South	SSI-F	$1,200 NS Only	$1,800
California	05	West	SSI-F	No limit	$1,800
Colorado	06	West	SSI-F	$1,200	$1,800
Connecticut	07	Northeast	State	No limit	$1,600
Delaware	08	South	SSI-F	$632	$1,800
Washington, D.C.	09	South	SSI-F	No limit	$2,600
Florida	10	South	SSI-F	$881 NS Only g/	$1,800 h/
Georgia	11	South	SSI-F	$927 g/	$1,800
Hawaii	12	West	State	No limit	$1,800
Idaho	13	West	SSI-S	$1,200	$1,800
Illinois	14	North Central	State	No limit	$1,800
Indiana	15	North Central	State	No limit	$1,500
Iowa	16	North Central	SSI-F	$1,200 NS Only	$1,800
Kansas	17	North Central	SSI-S	No limit	$1,800
Kentucky	18	South	SSI-F	No limit	$1,800
Louisiana	19	South	SSI-F	$1,200 NS Only	$1,800
Maine	20	Northeast	SSI-F	No limit	$1,800
Maryland	21	South	SSI-F	No limit	$2,500
Massachusetts	22	Northeast	SSI-F	No limit	$2,000
Michigan	23	North Central	SSI-F	No limit	$1,800
Minnesota	24	North Central	State	No limit	$3,750
Mississippi	25	South	SSI-F	$1,200	$1,800
Missouri	26	North Central	State	No limit	$999.99
Montana	27	West	SSI-F	No limit	$1,800
Nebraska	28	North Central	State	No limit	$1,600
Nevada	29	West	SSI-S	$734	$1,800
New Hampshire	30	Northeast	State	No limit	$2,500
New Jersey	31	Northeast	SSI-F	$1,200	$1,800 h/
New Mexico	32	West	SSI-F	$871	$1,800
New York	33	Northeast	SSI-F	No limit	$3,000
North Carolina	34	South	State	No limit	$1,500
North Dakota	35	North Central	State	No limit	$3,000
Ohio	36	North Central	State	No limit	$1,500
Oklahoma	37	South	State	$1,200 NS Only	$1,800
Oregon	38	West	SSI-S	No limit	$1,800
Pennsylvania	39	Northeast	SSI-F	No limit	$2,400
Rhode Island	41	Northeast	SSI-F	No limit	$4,000
South Carolina	42	South	SSI-F	$1,200	$1,800
South Dakota	43	North Central	SSI-F	$1,200	$1,800
Tennessee	44	South	SSI-F	$1,200 NS Only	$1,800
Texas	45	South	SSI-F	$658.65	$1,800
Utah	46	West	State	No limit	$1,800
Vermont	47	Northeast	SSI-F	No limit	$1,800
Virginia	49	South	State	No limit	$1,800
Washington	50	West	SSI-F	No limit	$1,800
West Virginia	51	South	SSI-F	No limit	$1,800
Wisconsin	52	North Central	SSI-F	No limit	$1,800
Wyoming	53	West	SSI-F	$1,200	$1,800

Source: Newschler, E., September 1987, "Congressional Research Service, Medicaid Eligibility for the Elderly in Need of Long-Term Care", tables, 1 (p.11), 3 (p.18), 5 (p.24), and A-1 (p.79).

Notes
-: not applicable.
**: Estimated.
+: Data for all licensed homes/ beds, not just those certified for participaiton in Medicaid.
NR: Not reported.
NA: Not available.
a/ Policies and standards in effect as of the second quarter of 1987 [effective July 1, 1987 or earlier].
b/ SSI-F: State follows SSI rules: Medicaid eligibility determined by Social Security Administration (SSA):
no separate application for Medicaid required for SSI eligibles.
SSI-S: State follows SSI rules: Medicaid eligibility determined by state or local agency;
separate application for Medicaid required.
State: State uses more restrictive state-defined rules: Medicaid eligibility determined by state or local agency:
separate application for Medicaid required.
c/ No limits: A nursing home resident who meet the resources test will be eligible for Medicaid services if his current monthly income is insufficient to cover his medical expenses, including the cost of care in the nursing home (usually calculated at the Medicaid payment rate).
d/ NS Only: Medicaid will pay only for nursing home services. Otherwise, it will pay for all other Medicaid-covered services.
e/ The SSI resources standard was $1,800, increased to $1,900 in January 1988 and to $2,000 in January 1989.
f/ Medicaid-certified beds ratio per 1,000 persons age 75 and over is shown in the source table. Since the subject of my reseach is the elderly age 65 and over, I calculated the Medicaid-certified beds ratio per 1,000 persons age 65 and over.
TABLE No.26 in Statistical Abstract of the United States, 1987 was used for the population of the elderly age 65 and over by state.
g/ Limit applies to net income after application of standard disregards and deductions usually applied in determining Medicaid eligibility (for the elderly, the first $20 per month of unearned income is disregarded). Otherwise, limit applies to gross income before application of any deductions or disregards.
h/ Two states, Florida ($5,000) and New Jersey ($3,600), use higher resource standards under their medically needy programs, but nursing home services are not covered for medically needy eligibles.

TABLE 1-7: STATE LONG-TERM CARE POLICIES: MEDICAID REIMBURSEMENT RATE FOR ICF SERVICES PER DAY; MEDICAID-CERTIFIED NURSING HOME BEDS (NUMBER AND RATIO PER 1,000 PERSONS AGE 65 AND OVER); COVERAGE OF "MEDICALLY NEEDY" PERSONS; HOME- AND COMMUNITY-BASED CARE; AND NURSING HOME PRE-ADMISSION SCREENING PROGRAM

State	Social Security Administration (SSA) area code	Area	Medically Needy program covers aged nursing home residents a/	Home- and community-based care b/	Nursing home pre-admission screening program d/ Prescreen 1 Immediate Medicaid eligibles e/	Prescreen 2 Expected Medicaid eligibles f/g/	Medicaid reimbursement rate for ICF services per day (1982/$) h/	Medicaid-certified nursing home beds (1985) Total	Ratio beds per 1,000 persons age 65 and over i/	Average weekly wage in Intermediate Care Facilities (ICFs) (1984/$) j/
Alabama	01	South	No	Yes	-	-	23.6	21,650	44.5	132.4
Alaska	02	West	No	No	-	-	NR	646	38.0	-
Arizona	03	West	-	-	-	-	NR	-	-	164.1
Arkansas	04	South	No	No	Yes	No	19.9	21,356	63.2	140.3
California	05	West	Yes-MN only	Yes	No	No	22.3	111,073	40.2	187.7
Colorado	06	West	No	Yes	Yes	All < 300% SSI	22.5	16,878	59.2	166.0
Connecticut	07	Northeast	+Yes-MN only	Yes	No	No	22.2	NR	-	214.1
Delaware	08	South	No	Yes	Yes	Elig "soon"	39.8	3,729	53.3	187.0
Washington, D C	09	South	Yes-MN only	No	Yes	No	49.0	4,584	60.3	224.0
Florida	10	South	No	Yes	Yes	No	23.0	47,683	23.8	178.4
Georgia	11	South	No	Yes	Yes	Elig < 180 days	19.2	32,319	54.4	142.0
Hawaii	12	West	Yes-MN only	Yes	-	-	55.6	2,821	28.5	246.0
Idaho	13	West	No	Yes	Yes	No	26.1	4,813	44.2	169.8
Illinois	14	North Central	Yes-MN only	Yes	Yes	Elig < 60 days	20.4	NR	-	161.8
Indiana	15	North Central	Yes-SD only	Yes	Yes	All private	NR	47,928	74.3	163.1
Iowa	16	North Central	No	No e/	Yes	No	17.5	33,200	80.4	146.4
Kansas	17	North Central	Yes-MN only	Yes	Yes	No	15.6	26,393	81.0	140.5
Kentucky	18	South	Yes	Yes	-	-	24.4	18,647	42.0	148.4
Louisiana	19	South	+No	Yes	-	-	24.5	32,595	73.9	145.2
Maine	20	Northeast	Yes	Yes	Yes	No	29.8	NR	-	183.9
Maryland	21	South	Yes-MN only	No	-	-	31.7	23,705	51.8	181.3
Massachusetts	22	Northeast	Yes-MN only	Yes	Yes	No	31.1	47,187	60.3	175.0
Michigan	23	North Central	+Yes-MN only	No	-	-	26.3	37,851	37.0	144.2
Minnesota	24	North Central	Yes-MN only	Yes	Yes	Elig < 180 days	29.3	46,984	90.0	166.7
Mississippi	25	South	No	Yes	-	-	23.9	13,882	44.8	153.2
Missouri	26	North Central	Yes-SD only	Yes	Yes	No	25.7	33,491	48.7	140.5
Montana	27	West	Yes-MN only	Yes	Yes	No	31.0	6,646	67.8	174.0
Nebraska	28	North Central	Yes-MN only	No	-	-	18.6	17,036	78.5	135.4
Nevada	29	West	No	Yes	Yes	Elig < 180 days	34.1	2,745	29.5	222.0
New Hampshire	30	Northeast	Yes	Yes	-	-	33.6	6,979	60.2	197.1
New Jersey	31	Northeast	No	Yes	Yes	-	34.1	38,845	40.7	202.7
New Mexico	32	West	No	Yes	-	-	28.8	6,047	43.5	151.3
New York	33	Northeast	Yes-MN only	Yes	Yes	No	38.8	99,506	44.1	244.7
North Carolina	34	South	Yes-MN only	Yes	-	-	25.9	NR	-	162.5
North Dakota	35	North Central	Yes-MN only	Yes	Yes	No	23.2	6,821	78.4	158.5
Ohio	36	North Central	Yes-SD only	Yes	Yes	No	23.3	78,866	60.9	161.0
Oklahoma	37	South	No	No	-	-	22.6	28,706	70.9	-
Oregon	38	West	Yes	Yes	Yes	All < 300 % SSI	22.0	14,837	41.9	154.0
Pennsylvania	39	Northeast	Yes	No	Yes	No	37.5	80,967	47.7	174.8
Rhode Island	41	Northeast	Yes	Yes	Yes	No	29.4	9,571	68.9	162.4
South Carolina	42	South	No	Yes	Yes	No	31.6	15,213	44.5	159.4
South Dakota	43	North Central	No	No	-	-	19.1	7,773	80.1	154.3
Tennessee	44	South	No	Yes	-	-	NR	26,403	45.8	140.5
Texas	45	South	No	No c/	-	-	19.4	94,866	61.7	169.3
Utah	46	West	Yes-MN only	No c/	-	-	26.0	6,692	51.5	153.4
Vermont	47	Northeast	+Yes	Yes	-	-	31.6	3,412	54.2	135.2
Virginia	49	South	+Yes	Yes	Yes	Elig < 180 days	32.6	21,693	37.0	157.6
Washington	50	West	Yes	Yes	Yes	No	22.4	26,205	51.9	169.1
West Virginia	51	South	Yes	Yes	-	-	30.0	9,417	36.6	164.9
Wisconsin	52	North Central	Yes-MN only	Yes	Yes	No	29.8	52,000	84.3	160.1
Wyoming	53	West	No	No	-	-	28.1	2,279	54.3	173.0

Sources. Newschler, E., September 1987, "Congressional Research Service, Medicaid Eligibility for the Elderly in Need of Long Term Care", tables, 5 (p 24), 6 (p 28), 7 (p.32) and D-1 (p.124).
US Department of Health and Human Services, Health Care Financing Administration Office of Research and Demonstrations, June 1986, Health Care Financing Program Statistics, Medicare and Medicaid Data Book, Baltimore, Maryland, tables 4 12 (pp 85-87) and 4 17 (pp 94-97)
US Department of Labor Bureau of Labor Statistics, November 1985, "Employment and Wages, Annual Average, 1984", Bulletin 2249, Washington, D C

Notes (Excerpted from "Medicaid Eligibility for the Elderly in Need of Long-Term Care")
Policies and standards in effect as of the second quarter of 1987 [effective July 1, 1987 or earlier].
-: not applicable.
NR: Not reported.
a/ Addresses whether Medicaid coverage of nursing home costs is available under the medically needy option.
"MN only": Nursing home residents who do not qualify for a cash payment are covered as only medically needy; a special income level is not used.
"SD only": The state does not have a regular medically needy program. Nursing home residents who do not qualify for a cash payment are covered only under the "spend-down" process the state is required to implement because it uses Medicaid eligibility rules more restrictive than those used by SSI.
+: Connecticut, Louisiana, Michigan, Vermont and Virginia have medically needy income levels which vary by geographic area within the state.
b/ This column indicates whether the state has a formal program providing home- and community-based services for eldelry Medicaid eligibles who would otherwise need to be in a nursing home, approved under section 1915 [c] of the Social Secutity Act.
c/ Program formerly in effect has expired.
d/ Policies in effect as of Fall 1985.
e/ This column indicates whether a Pre-Admission Screening [PAS] program is required for "immediate Medicaid eligibles", i.e., those who already hold a Medicaid card or who will be eligible for Medicaid immediately upon admission to a nursing home.
f/ This column addresses whether PAS is required for "expected Medicaid eligibles", i.e., applicants who are expected to become eligible for Medicaid within a reasonable period after nursing home admission. The definition of "expected" varies by states
g/ All < 300% SSI: All applicants whose monthly income is less than 300% of the current federal SSI payments, i.e., those who meet the Medicaid income requirement and will be eligible for Medicaid once their assets are reduced to Medicaid levels.
"Elig < X days": Applicants who are expected to become eligible for Medicaid within X days after admission to the nursing home "X" is 60 or 180.
"Elig soon": Applicants who are expected to become eligible "soon" after nursing home admission. The state does not further operationalize the definition of "soon".
"All private": PAS is required for all nursing home applicants as a condition of any subsequent Medicaid payment for the nursing home care.
h/ Medicaid reimbursement rate per day = Total Medicaid payments for Intermediate Care Facility (ICF) services / Total service days of ICF services.
i/ Medicaid-certified beds ratio per 1,000 persons age 75 and over is shown in the source table. Since the subjects of my reseach is the elderly age 65 and over, I calculate the Medicaid-certified beds ratio per 1,000 persons age 65 and over. TABLE No. 26 in Statistical Abstract of the United States, 1987 was used for the populaiton of the elderly age 65 and over by state.
j/ US Department of Labor Bureau of Labor Statistics, November 1985, "Employment and Wages, Annual Average, 1984", Bulletin 2249, Washington, D.C..

TABLE 1-8: SUMMARY OF STUDIES ON UTILIZATION OF FORMAL COMMUNITY-BASED CARE BY THE ELDERLY

	Branch et al.	Coulton & Frost	Soldo	McAuley & Arling	Garber	Liu et al.	Williams et al.	Hanley & Wiener	Kemper
Year	1981	1982	1983	1984	1989	1990	1990	1991	1992
Data	SWSMT	SOPCO	NHIS	SWSVA1	NLTCS	NLTCCD	SWSVA2	NLTCS	NLTCCD
Sample size used by the study and age of sample members									
	1,625 (65+)	1,519 (65+)	1,431 (65+)	524 (75+)	3,688 (65+)	3,274 (65+) a/	1,984 (all) b/	1,228 (65+)	3,117 (65+)
Dependent variable									
	the chance of using any type of care	# using different types of care	the chance of using any type of care	# using different types of care	# of days of care	the cost of care	# of visits	# of visits	# of hours of care
Findings on independent variables									
(i) Demographic characteristics									
Age	ns	+		ns	ns	+	ns	+	+
Children					+			-	-
Education	ns	ns		+	ns				+
Not married	ns		+	ns		ns		+	+
Race (White)	ns	ns	ns	ns		ns		ns	+
Sex (Female)	ns	ns	ns	ns	ns	+	ns	ns	+
Urban			+	+				ns	ns

TABLE 1-8 - Continued

	Branch et al.	Coulton & Frost	Soldo	McAuley & Arling	Garber	Liu et al.	Williams et al.	Hanley & Wiener	Kemper
(ii) Disability/health status									
ADL	+	+	+	+	+	+		+	+
IADL	ns		ns	-	ns				
Cognition		ns	+	ns		±	ns	+	±
Acute care	+			ns			ns		+
(iii) Socioeconomic characteristics									
Asset				ns	+	+		ns	
Income	+	ns	-	ns	ns	+		ns	+
Medicaid	ns	ns			ns	ns	ns	+	ns
Private insurance	ns		ns						

TABLE 1-8 - Continued

Notes:

SWSMT: A state wide survey of random probability sample of 1,625 noninstitutionalized elders 65 years of age or older living in Massachusetts, initiated in 1974 by the Massachusetts Department of Public Health and conducted by the Center for Survey Research.

SOPCO: The Study of Older People in Cleveland, Ohio, 1975 and 1976, conducted by the United States General Accounting Office (Comptroller General of the United States, 1977).

NHIS: The 1979 National Health Interview Survey. The NHIS is a personal interview survey providing coverage of the resident, civilian, noninstitutionalized population with a probability, rotating sample design. The study used 1,431 observations aged 65 and over, which consists of 359 persons who received formal community-based care and 1,072 persons who did not.

SWSVA1: A statewide survey of Older Virginians in 1979, which was funded by the Virginia Department of Social Services and the Virginia Department of the Aging. This was a household survey on 2,146 older people aged 60 and over, including 524 very old persons (aged 75 and over).

NLTCS: The 1982 National Long-Term Care Survey.

NLTCCD: The 1982-1983 National Long-Term Care Channeling Demonstration.

SWSVA2: A state wide survey of diagnosis-related groups in home health services in Virginia in 1982-1985, by the Virginia Department of Health. Data were gathered from 1,984 episodes of care randomly sampled from home health care agencies of the Virginia Health Department.

+ : An increase or positive response to the independent variable led to an increase in formal home care use.

- : An increase or positive response to the independent variable led to a decrease in formal home care use.

ns: The coefficient is not significant.

± : More than one independent variable of the same type was tested, at least one of which led to an increase in formal care use and at least one led to a decrease in formal care use.

a/ The sample size is a little different among regressions.

b/ Out of 1,984, 572 sample persons (29.1%) are younger than 65; 524 (26.7%) are between 65 and 74; and 75 (44.3%) are 75 and over.

TABLE 1-9: SUMMARY OF STUDIES ON UTILIZATION OF INFORMAL COMMUNITY-BASED CARE BY THE ELDERLY

	Greene	Stoller	Moscovice et al.	Garber	Dwyer & Miller	Edelman & Hughes	Kemper
Year	1983	1983	1988	1989	1990	1990	1992
Data	CSS	NENY	PAS/ACG	NLTCS	NLTCS(ICS)	FHP & HDM	NLTCCD
Sample size used by the study and age of sample members	124 (60+)	753 (65+)	214 (65+)	3,688 (65+)	1,388 (65+)	225 (65+)	3,339 (65+) a/
Dependent variable	# using different type of care	# of hours of care	# of hours of care	# of days of care	# of hours of care, # of helpers, stress, & burden	# using different types of care	# of hours of care
Findings on independent variables							
(i) Demographic characteristics							
Age		+	ns	-		ns	ns
Children				+			+
Education				ns		ns	-
Formal care	-		ns		ns	-	
Not married		- b/				+ b/	± d/
Race (White)	ns					ns	+
Sex (Female)				+ c/			ns
Urban							ns

TABLE 1-9 - Continued

	Greene	Stoller	Moscovice et al.	Garber	Dwyer & Miller	Edelman & Hughes	Kemper
Helper's age			ns				
Helper's children		+ f/	ns				
Helper's marital status		-					
Helper's sex			ns c/				
(ii) Disability/health status							
ADL	+	+	+ g/	ns	+		+
IADL			+ h/	ns	+		
Cognition	+		+				+
Acute care				±			±
Helper's health status			ns				
(iii) Socioeconomic characteristics							
Asset							
Income				-			ns
Medicaid				-			ns
State home care program							-
Helper's income			ns				
Helpers' job status		-					

TABLE 1-9 - Continued

Notes:

CSS: The data to be analyzed consist of a simple random sample of the Community Services System (CSS) client case load population that is older than age 60. The major program goal is to provide in-home services to frail, elderly individuals in order to delay or prevent institutionalization. Data were gathered in 1980 in the Tucson, Arizona, metropolitan area (Pima County).

NENY: Data were obtained through in-depth personal interviews with a linear probability sample of 753 noninstitutionalized persons 65 years of age or over, living in a 17-county region of northeastern New York, and with their informal helpers. Because the data were collected originally for a project with a rural focus, the sample was stratified to ensure sufficient numbers of nonmetropolitan respondents; 173 interviews were conducted with elderly persons living in a five-county Standard Metropolitan Statistical Area (SMSA), and 580 interviews were conducted with older persons living in a geographically contiguous 12-county nonmetropolitan region.

NLTCCD: The 1982-1983 National Long-Term Care Channeling Demonstration.

PAS/ACG: The Minnesota State Legislature established the Pre-Admission Screening/ Alternative Care Grants Program (PAS/ACG) to reduce inappropriate nursing home placement and encourage the development of community-based services as an alternative to institutionalization for the elderly. The 214 elderly were screened from the PAS/ACG clients.

NLTCS: The 1982 National Long Term Care Survey and the National Survey of Informal Caregivers (ICS) in the 1982 NLTCS.

FHP & HDM: The Five Hospital Program (Hughes et al., 1984, 1987, and 1988) and the Home-Delivered Meals Program. The FHP provides long term home care to chronically ill, homebound elderly persons in Chicago. Clients of a geographically contiguous HDM program served as a comparison group in the original evaluation. Both groups consisted of homebound individuals who were at least 60 years of age and were consecutively accepted to care between June 1977 and December 1979.

NLTCCD: The 1982-1984 National Long-Term Care Demonstration (Channeling).

+ : An increase or positive response to the independent variable led to an increase in formal home care use.

- : An increase or positive response to the independent variable led to a decrease in formal home care use.

ns: The coefficient is not significant.

± : More than one independent variable of the same type was tested, at least one of which led to an increase in formal care use and at least one led to a decrease in formal care use.

a/ The sample size is different among regressions

b/ 1 if a sample person is not married; 0 otherwise.

c/ 1 if a sample person is male; 0 otherwise.

d/ Regardless of the marital status, having children increases the probability of using informal community-based care, while a person married without a child is less likely to use unpaid home care.

f/ Number of helper's children under 6 has a significant positive effect on hours of care by an elderly person's son.

g/ Include limitations in dressing, eating, bathing, incontinence, and transferring. Only the coefficient of ADL limitations in eating is significant.

h/ Include limitations in telephone calls, taking medicine, and preparing meals. Only the coefficient of IADL limitations in taking medicine is significant.

TABLE 1-10: SUMMARY OF STUDIES ON UTILIZATION OF INSTITUTIONAL CARE BY THE ELDERLY

	Greene & Ondrich	Hanley et al.	Liu et al.	Garber & MaCurdy	Headen	Greene et al.	Cutler & Sheiner	Ettner	Boaz & Muller
Year	1990	1990	1991	1992	1993	1993	1993	1993	1994
Data	NLTCCD	NLTCS	NLTCS	NLTCCD	NLTCS	NLTCCD	NTLCS	NLTCS	NLTCS
Sample size (all are 65+)	3,332	5,537	4,616	8,596	5,215	3,017	4,374	416	4,832
Dependent variable	the chance of entering nursing home	the chance of entering nursing home	length of stay	the chance of entering nursing home	length of stay	length of stay	the chance of entering nursing home	the chance of being on a waiting list	length of stay
Findings on independent variables									
(i) Demographic characteristics									
Age	+	+	+	ns	+	+	+	ns	+
Children		ns		-	-	-	-		-
Education	ns			ns					
Formal home care		+	+		ns				+
Informal home care	ns	ns	+						
Living alone	+	+	+			ns			+
Not married	ns a/	ns	ns a/	- a/	+		ns		
Race (White)	- b/	+	+	- b/	+	ns b/	+		- b/
Sex (Female)	ns c/	ns	-	+ c/	+ c/	ns	ns c/		ns

TABLE 1-10 - Continued

	Greene & Ondrich	Hanley et al.	Liu et al.	Garber & MaCurdy	Headen	Greene et al.	Cutler & Sheiner	Ettner	Boaz & Muller
(ii) Disability/health status									
ADL	+	+	+	+	+ h/		+	ns	+
IADL	+					ns	+	-	
Cognition	+	+	+	ns	+	ns			+
Previous nursing home utilization			+	+	+		+ k/		
Acute care			+ d/	+ f/	+ i/		ns		
(iii) Socioeconomic characteristics									
Liquid assets		+ e/				ns l/			
Income	ns	ns	+ g/	ns	- j/	ns	ns		
Medicaid			ns	+	ns			+	
Own home	-	-	-	-	-	ns	-		
Private insurance				+				ns	
- State specific policy variables									
Bed supply	+		+			+		-	
Home care waiver							ns		
Medicaid rate			-						
Medicaid underpayment							-		
Medically needy							+		
Out-of-pocket price					-				

TABLE 1-10 - Continued

Notes:

NLTCS: The National Long-Term Care Survey.

NLTCCD: The 1982-1983 National Long-Term Care Channeling Demonstration.

+ : An increase or positive response to the independent variable led to an increase in formal home care use.

- : An increase or positive response to the independent variable led to a decrease in formal home care use.

ns: The coefficient is not significant.

a/ 1 If a person is married.

b/ 1 if a person is non-White.

c/ 1 if a person is male.

d/ Prior hospitalization.

e/ Includes two dummy variables: 1 if a person has low assets (less than median); and 1 if a person has high assets (median or greater). The definition of assets is interest and dividend income received by a disabled elderly sample person or spouse in last 12 months. Compared with those without assets, the elderly with high assets are more likely to enter a nursing home. However, the coefficient of low assets is not significant.

f/ Includes three groups of acute health conditions as follows: (i) cancer, bone fracture, or stroke; (ii) pneumonia, bronchitis, emphysema, asthma; and (iii) multiple sclerosis, cerebral palsy, epilepsy, or Parkinson's disorder. The coefficient of first two groups are significant.

g/ Includes three dummy variables: 1 if a person's income is between $500 and $1,000; 1 if it is between $1,000 and 1,500; and 1 if it is more than $1,500, per month. Only the coefficient of the lowest income group is significant.

h/ Includes five dummy variables: 1 if a person need help for toileting; eating; bathing; dressing; moving. Only the coefficient of bathing is significant.

i/ Includes four groups of acute health conditions as follows: 1 if a person has cancer; a stroke; a broken hip; and respiratory disease (asthma, bronchitis, or emphysema), in last year. All the coefficients are significant, and only that of respiratory disease is negative.

j/ Includes three kinds of income: 1 if a person receive private pension income; dividend income; and rental income. The coefficients of pension and rental income are significantly negative.

k/ Includes three dummy variables as follows: 1 if a person has a stroke and a broken hip; and if a person utilized the hospital. The coefficient of stroke is significantly positive.

l/ Includes interest and dividend income.

TABLE 2-1: CROSS CORRELATION AMONG STATE POLICY VARIABLES

	M_NEEDY	H_WAIVER	PAS1	PAS2	MEDRAT	MEDBED65
M_NEEDY	1.0000					
	(0.0)					
H_WAIVER	0.24020	1.00000				
	(0.0001)	(0.0)				
PAS1	0.16932	0.49947	1.00000			
	(0.0001)	(0.0001)	(0.0)			
PAS2	-0.03328	0.16537	0.25951	1.00000		
	(0.0248)	(0.0001)	(0.0001)	(0.0)		
MEDRAT	0.39749	0.34197	0.42606	-0.09367	1.00000	
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0)	
MEDBED65	0.02018	-0.22852	0.07396	0.13938	-0.17872	1.00000
	(0.1738)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0)

Notes: (): Each value of the probability [p] of accepting the null hypothesis (the correlation statistic is zero) comes from a t-distribution with n-2 degrees of freedom (n = number of observations). Therefore, if 0.05 <= p <= 0.10, the null hypothesis can be rejected at a probability of more than 90% or if p < 0.05, then the null hypothesis can be rejected at a probability of more than 95%.

M_NEEDY: 1 if "Medically Needy" program covers aged nursing home residents; 0 otherwise.

H_WAIVER: 1 if the state has a formal program providing home- and community-based services for elderly Medicaid eligibles who would otherwise need to be in a nursing home; 0 otherwise.

PAS1: 1 if a state has a Pre-admission Screening (PAS) program which is required for "immediate Medicaid eligibles"; 0 otherwise.

PAS2: 1 if a state has a Pre-admission Screening (PAS) program which is required for "expected Medicaid eligibles"; 0 otherwise.

MEDRAT: Continuous variable indicating a state's Medicaid reimbursement rate for Intermediate Care Facilities.

MEDBED65: Continuous variable indicating number of a state's Medicaid-certified beds per 1,000 persons age 65 and over.

LG_PRICE: Log value of weekly average wage in Intermediate Care Facilities in the state.

TABLE 2-2: DEFINITIONS OF EXPLANATORY VARIABLES FOR ESTIMATING PROBABILITIES OF NURSING HOME ENTRY AND DEATH IN THE COMMUNITY; AND OF NURSING HOME DISCHARGE AND DEATH IN A NURSING HOME

Variable	Variable definition
LOSC_M	Length of stay in the community (months).
LOSN_M	Length of stay in a nursing home (months).
I. State policy	
MEDICAID	1 if a respondent has Medicaid; 0 otherwise.
M_NEEDY	1 if "Medically Needy" program covers aged nursing home residents; 0 otherwise.
H_WAIVER	1 if the state has a formal program providing home- and community-based care for elderly Medicare eligibles who would otherwise need to be in a nursing home; 0 otherwise.
PAS1	1 if the state has a Pre-Admission Screening (PAS) program which is required for "immediate Medicaid eligibles"; 0 otherwise.
PAS2	1 if the state has a Pre-Admission Screening (PAS) program which is required for "expected Medicaid eligibles"; 0 otherwise.
MEDLGRAT	Medicaid interaction term: Medicaid * log value of Medicaid reimbursement rate per day for Intermediate Care Facility (ICF) services.
MEDLGBED	Medicaid interaction term: Medicaid * log value of the number of certified beds per 1,000 persons age 65 and over in the state.
LG_PRICE	Log value of weekly average wage in Intermediate Care Facilities (ICF) in the state.
II. Demographic status	
WHITE	1 if a respondent is white; 0 otherwise.
MALE	1 if a respondent is male; 0 otherwise.
MARRIED	1 if a respondent is married; 0 otherwise.
AGE	Continuous variable indicating respondent's age.
HHOLD	Number of persons in the household.
NCHILD	Number of children not living with a respondent.
III. Activities of Daily Living (ADLs) and Instrumental Activities of Daily Living (IADLs) limitations a/ b/	
ADL1	1 if independent in all but one of following 5 ADLs: bathing; dressing; going to toilet; transferring; and eating; 0 otherwise.
ADL2	1 if independent in all but bathing, and one additional function; 0 otherwise.
ADL3	1 if independent in all but bathing, dressing and one additional function; 0 otherwise.

TABLE 2-2 - Continued

ADL4	1 if independent in all but bathing, dressing, going to toilet, and one additional function; 0 otherwise.
ADL5	1 if independent in all 5 ADLs; 0 otherwise.
IADLS	1 if a respondent has any IADLs limitations; 0 otherwise.
IV. Health status other than ADLs and IADLs	
SENILE	1 if a respondent is reported to be senile; 0 otherwise.
CANCER	1 if a respondent has cancer; 0 otherwise.
STROKE	1 if a respondent has had a stroke; 0 otherwise.
LUNG	1 if a respondent has pneumonia, bronchitis, emphysema, asthma; 0 otherwise.
HIPBREAK	1 if a respondent has had a broken hip; 0 otherwise.
NEUROL	1 if a respondent has multiple sclerosis, cerebral palsy, epilepsy, or Parkinson disorder; 0 otherwise.
V. Utilization and accessibility of acute medical care services	
PRIHOSP	1 if a respondent had stayed over night in a hospital in 12 months; 0 otherwise.
URBAN	1 if a respondent is living in the city where population is 50,000 and over; 0 otherwise.
VII. Economic status	
LOG_FINC	Log value of monthly income from other family members than the elderly.
LOG_ASST	Log value of annual interest and dividend income received by a respondent and/or a respondent's spouse in the last 12 months.
OWNHOME	1 if a respondent own a house; 0 otherwise.

Notes:

a/ The index is based on the article of Katz, S. and Akpom, A. (1976).

b/ The index is based on the following IADLs: doing heavy and light work; doing laundry; preparing meals; shopping for groceries; getting around outside; going places outside of walking distance; managing money; and making telephone calls.

TABLE 2-3: EXPLANATORY VARIABLES FOR ESTIMATING PROBABILITIES OF NURSING HOME ENTRY AND DEATH IN THE COMMUNITY IN TWO PERIODS: 1982-1984 AND 1984-1989: MEANS AND STANDARD DEVIATIONS, BY CENSORING STATUS [ALL MEASURED IN 1982 AND 1984 EXCEPT FOR STATE POLICY VARIABLES]

Mean (Standard deviation)

	1982-1984					1984-1989				
	Total sample in the community at the interview in 1982 NLTCS used for						Total sample in the community at the interview in 1984 NLTCS used for			
		Analysis for C→N		Analysis for C→D			Analysis for C→N		Analysis for C→D	
	Total	Censored	Uncensored	Censored	Uncensored	Total	Censored	Uncensored	Censored	Uncensored
		C→C or D	C→N	C→C or N	C→D		C→C or D	C→N	C→C or N	C→D a/
Number of observations										
	4547	3989	558	3728	819	1985	1667	318	1859	126
LOSC_M	22.230	22.198	22.462	24.501	11.895	51.567	54.588	35.726	53.688	20.270
	(5.921)	(6.117)	(4.256)	(2.077)	(6.685)	(14.639)	(12.303)	(15.683)	(10.454)	(26.883)
LOSN_M	-	-	-	-	-	-	-	-	-	-
	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)
I. State policy b/c/										
MEDICAID	0.269	0.265	0.292	0.273	0.248	0.311	0.311	0.314	0.309	0.341
	(0.443)	(0.442)	(0.455)	(0.446)	(0.432)	(0.463)	(0.463)	(0.465)	(0.462)	(0.476)
M_NEEDY	0.605	0.599	0.651	0.602	0.619	0.590	0.579	0.648	0.587	0.635
	(0.489)	(0.490)	(0.477)	(0.489)	(0.486)	(0.492)	(0.494)	(0.478)	(0.493)	(0.483)
H_WAIVER	0.775	0.775	0.771	0.769	0.802	0.764	0.761	0.780	0.762	0.794
	(0.418)	(0.417)	(0.421)	(0.422)	(0.399)	(0.425)	(0.427)	(0.415)	(0.426)	(0.406)
PAS1	0.583	0.578	0.615	0.579	0.601	0.567	0.560	0.607	0.563	0.635
	(0.493)	(0.494)	(0.487)	(0.494)	(0.490)	(0.496)	(0.497)	(0.489)	(0.496)	(0.483)
PAS2	0.086	0.086	0.082	0.089	0.074	0.091	0.092	0.085	0.089	0.111
	(0.280)	(0.281)	(0.275)	(0.284)	(0.263)	(0.287)	(0.289)	(0.279)	(0.285)	(0.316)
MEDLGRAT	0.874	0.864	0.945	0.888	0.813	1.008	1.007	1.014	1.001	1.109
	(1.448)	(1.443)	(1.478)	(1.453)	(1.422)	(1.506)	(1.506)	(1.505)	(1.503)	(1.552)
MEDLGBED	1.044	1.030	1.141	1.064	0.954	1.211	1.206	1.239	1.203	1.334
	(1.726)	(1.718)	(1.783)	(1.739)	(1.666)	(1.807)	(1.802)	(1.837)	(1.804)	(1.867)
LG_PRICE	5.085	5.092	5.034	5.079	5.110	3.779	3.801	3.669	3.777	3.813
	(0.516)	(0.486)	(0.695)	(0.533)	(0.432)	(2.259)	(2.245)	(2.330)	(2.261)	(2.235)

TABLE 2-3 - Continued

Mean (Standard deviation)

	1982-1984					**1984-1989**				
	Total sample in the community at the interview in 1982 NLTCS used for					Total sample in the community at the interview in 1984 NLTCS used for				
		Analysis for C→N		Analysis for C→D			Analysis for C→N		Analysis for C→D	
	Total	Censored	Uncensored	Censored	Uncensored	Total	Censored	Uncensored	Censored	Uncensored
		C→C or D	C→N	C→C or N	C→D		C→C or D	C→N	C→C or N	C→D a/
II. Demographic status										
WHITE	0.864	0.853	0.943	0.869	0.841	0.862	0.849	0.931	0.857	0.944
	(0.343)	(0.354)	(0.233)	(0.338)	(0.366)	(0.344)	(0.358)	(0.254)	(0.350)	(0.230)
MALE	0.360	0.373	0.263	0.337	0.464	0.314	0.329	0.236	0.311	0.357
	(0.480)	(0.484)	(0.441)	(0.473)	(0.499)	(0.464)	(0.470)	(0.425)	(0.463)	(0.481)
MARRIED	0.428	0.450	0.274	0.426	0.438	0.405	0.434	0.252	0.424	0.111
	(0.495)	(0.498)	(0.447)	(0.495)	(0.496)	(0.491)	(0.496)	(0.435)	(0.494)	(0.316)
AGE	77.015	76.658	79.566	76.535	79.203	76.887	76.272	80.107	76.579	81.429
	(7.525)	(7.507)	(7.153)	(7.328)	(8.011)	(6.828)	(6.643)	(6.893)	(6.625)	(8.092)
HHOLD	2.097	2.118	1.946	2.050	2.310	2.100	2.127	1.959	2.128	1.690
	(1.218)	(1.226)	(1.151)	(1.169)	(1.402)	(1.194)	(1.188)	(1.218)	(1.195)	(1.113)
NCHILD	2.255	2.319	1.799	2.299	2.057	1.834	1.894	1.516	1.853	1.556
	(2.226)	(2.260)	(1.910)	(2.247)	(2.118)	(2.164)	(2.179)	(2.056)	(2.180)	(1.895)
III. Activities of Daily Living (ADLs) and Instrumental Activities of Daily Living (IADLs) limitations										
ADL1	0.235	0.237	0.219	0.236	0.230	0.213	0.212	0.217	0.222	0.071
	(0.424)	(0.426)	(0.414)	(0.425)	(0.421)	(0.409)	(0.409)	(0.413)	(0.416)	(0.259)
ADL2	0.112	0.106	0.152	0.111	0.115	0.097	0.088	0.148	0.100	0.056
	(0.315)	(0.308)	(0.360)	(0.314)	(0.319)	(0.296)	(0.283)	(0.355)	(0.300)	(0.230)
ADL3	0.031	0.030	0.039	0.028	0.046	0.023	0.022	0.025	0.024	0.000
	(0.175)	(0.172)	(0.195)	(0.165)	(0.210)	(0.149)	(0.147)	(0.157)	(0.154)	(0.000)
ADL4	0.068	0.064	0.095	0.063	0.088	0.046	0.043	0.066	0.046	0.056
	(0.251)	(0.244)	(0.293)	(0.243)	(0.283)	(0.210)	(0.202)	(0.249)	(0.209)	(0.230)
ADL5	0.102	0.093	0.161	0.082	0.189	0.058	0.050	0.097	0.060	0.032
	(0.302)	(0.291)	(0.368)	(0.275)	(0.392)	(0.234)	(0.219)	(0.297)	(0.237)	(0.176)
IADLS	0.896	0.886	0.971	0.884	0.954	0.819	0.807	0.877	0.809	0.960
	(0.305)	(0.318)	(0.167)	(0.320)	(0.210)	(0.385)	(0.394)	(0.329)	(0.393)	(0.196)

TABLE 2-3 - Continued

	Mean (Standard deviation)									
	1982-1984					**1984-1989**				
	Total sample in the community at the interview in 1982 NLTCS used for					Total sample in the community at the interview in 1984 NLTCS used for				
		Analysis for C→N		Analysis for C→D			Analysis for C→N		Analysis for C→D	
	Total	Censored C→C or D	Uncensored C→N	Censored C→C or N	Uncensored C→D	Total	Censored C→C or D	Uncensored C→N	Censored C→C or N	Uncensored C→D a/
IV. Health status other than ADLs and IADLs										
SENILE	0.092	0.081	0.170	0.076	0.166	0.048	0.037	0.107	0.045	0.103
	(0.290)	(0.274)	(0.376)	(0.265)	(0.372)	(0.215)	(0.189)	(0.309)	(0.207)	(0.305)
CANCER	0.061	0.061	0.061	0.043	0.143	0.043	0.046	0.025	0.038	0.119
	(0.240)	(0.240)	(0.239)	(0.204)	(0.350)	(0.203)	(0.210)	(0.157)	(0.190)	(0.325)
STROKE	0.069	0.064	0.106	0.060	0.111	0.048	0.043	0.072	0.040	0.159
	(0.253)	(0.244)	(0.308)	(0.237)	(0.314)	(0.214)	(0.203)	(0.259)	(0.197)	(0.367)
LUNG	0.253	0.262	0.194	0.245	0.289	0.222	0.239	0.129	0.218	0.278
	(0.435)	(0.440)	(0.395)	(0.430)	(0.454)	(0.415)	(0.427)	(0.336)	(0.413)	(0.450)
HIPBREAK	0.022	0.018	0.054	0.023	0.021	0.009	0.008	0.013	0.009	0.016
	(0.148)	(0.133)	(0.226)	(0.149)	(0.143)	(0.095)	(0.091)	(0.112)	(0.092)	(0.125)
NEUROL	0.047	0.041	0.090	0.046	0.054	0.037	0.038	0.031	0.036	0.056
	(0.212)	(0.199)	(0.286)	(0.209)	(0.226)	(0.188)	(0.191)	(0.175)	(0.185)	(0.230)
V. Utilization and accessibility of acute medical care services										
PRIHOSP	0.351	0.343	0.401	0.323	0.477	0.254	0.260	0.223	0.244	0.413
	(0.477)	(0.475)	(0.491)	(0.468)	(0.500)	(0.436)	(0.439)	(0.417)	(0.429)	(0.494)
URBAN	0.428	0.428	0.423	0.422	0.454	0.405	0.404	0.409	0.401	0.460
	(0.495)	(0.495)	(0.494)	(0.494)	(0.498)	(0.491)	(0.491)	(0.492)	(0.490)	(0.500)
VII. Economic status										
LOG_FINC	5.881	5.885	5.851	5.870	5.930	5.915	5.957	5.696	5.907	6.031
	(2.097)	(2.087)	(2.167)	(2.084)	(2.155)	(1.994)	(1.964)	(2.136)	(1.995)	(1.993)
LOG_ASST	1.646	1.616	1.862	1.660	1.584	1.546	1.552	1.512	1.610	0.605
	(3.048)	(3.018)	(3.250)	(3.065)	(2.972)	(2.933)	(2.943)	(2.887)	(2.973)	(2.065)
OWNHOME	0.526	0.540	0.427	0.527	0.525	0.306	0.335	0.157	0.303	0.357
	(0.499)	(0.498)	(0.495)	(0.499)	(0.500)	(0.461)	(0.472)	(0.365)	(0.460)	(0.481)

TABLE 2-3 - Continued

Notes:

a/ C→C or D and C→C or N stand for elderly persons who were treated as censored in the competing-risks model, representing those who stay in the community (C→C); or who died (D) or who entered nursing homes (N) between interviews of the 1982 and 1984; and 1984 and 1989 NLTCS. C→N and C→D stand for those who were treated as uncensored in the regression model, representing those who entered nursing homes from the community and who died in the intervals between two surveys.

b/ Measured in 1982 for Medicaid reimbursement rate and weekly wage; in 1985 for Medicaid-certified nursing home beds; and in 1983 for others.

c/ Changes in interaction terms of a Medicaid dummy; and Medicaid reimbursement rate, the number of Medicaid-certified nursing home beds, and weekly wage are based on a change in the number of Medicaid eligibles from 1982 through 1984, but not based on changes in the reimbursement rate, the number of Medicaid certified nursing home beds, and weekly wage, themselves, for which information is not available in 1984.

TABLE 2-4: EXPLANATORY VARIABLES FOR ESTIMATING PROBABILITIES OF NURSING HOME DISCHARGE AND DEATH IN A NURSING HOME IN TWO PERIODS: 1982-1984 AND 1984-1989: MEANS AND STANDARD DEVIATIONS, BY CENSORING STATUS [ALL MEASURED IN 1982 AND 1984 EXCEPT FOR STATE POLICY VARIABLES]

	Mean (Standard deviation)									
	1982-1984					1984-1989				
	Total sample in a nursing home between the 1982 and 1984 NLTCS used for					Total sample in a nursing home between the 1982 and 1984 NLTCS used for				
		Analysis for N→C		Analysis for N→D			Analysis for N→C		Analysis for N→D d/	
	Total	Censored	Uncensored	Censored	Uncensored	Total	Censored	Uncensored	Censored	Uncensored
		N→N or D	N→C	N→N or C	N→D		N→N or D	N→C	N→N or C	N→D a/
Number of observations	464	330	134	388	76	254	203	51	254	0
LOSC_M	-	-	-	-	-	-	-	-	-	-
	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)
LOSN_M	6.857	8.583	2.605	7.276	4.717	21.626	22.591	17.785	21.626	-
	(6.473)	(6.557)	(3.730)	(6.718)	(4.500)	(16.181)	(16.499)	(14.362)	(16.181)	(-)
I. State policy b/c/										
MEDICAID	0.276	0.291	0.239	0.268	0.316	0.299	0.345	0.118	0.299	-
	(0.447)	(0.455)	(0.428)	(0.444)	(0.468)	(0.459)	(0.476)	(0.325)	(0.459)	(-)
M_NEEDY	0.644	0.630	0.679	0.637	0.684	0.626	0.611	0.686	0.626	-
	(0.479)	(0.483)	(0.469)	(0.482)	(0.468)	(0.485)	(0.489)	(0.469)	(0.485)	(-)
H_WAIVER	0.787	0.794	0.769	0.789	0.776	0.787	0.793	0.765	0.787	-
	(0.410)	(0.405)	(0.423)	(0.409)	(0.419)	(0.410)	(0.406)	(0.428)	(0.410)	(-)
PAS1	0.638	0.639	0.634	0.647	0.592	0.630	0.635	0.608	0.630	-
	(0.481)	(0.481)	(0.483)	(0.479)	(0.495)	(0.484)	(0.482)	(0.493)	(0.484)	(-)
PAS2	0.086	0.085	0.090	0.088	0.079	0.094	0.089	0.118	0.094	-
	(0.281)	(0.279)	(0.287)	(0.283)	(0.271)	(0.293)	(0.285)	(0.325)	(0.293)	(-)
MEDLGRAT	0.896	0.948	0.768	0.872	1.017	0.964	1.114	0.365	0.964	-
	(1.458)	(1.487)	(1.379)	(1.448)	(1.513)	(1.483)	(1.545)	(1.010)	(1.483)	(-)
MEDLGBED	1.076	1.136	0.927	1.046	1.228	1.184	1.365	0.464	1.184	-
	(1.751)	(1.782)	(1.668)	(1.737)	(1.825)	(1.820)	(1.890)	(1.291)	(1.820)	(-)
LG_PRICE	5.046	5.033	5.079	5.061	4.973	3.746	3.578	4.415	3.746	-
	(0.642)	(0.702)	(0.460)	(0.597)	(0.833)	(2.296)	(2.383)	(1.780)	(2.296)	(-)

TABLE 2-4 - Continued

Mean (Standard deviation)

	1982-1984					1984-1989				
	Total sample in a nursing home between the 1982 and 1984 NLTCS used for					Total sample in a nursing home between the 1982 and 1984 NLTCS used for				
		Analysis for N→C		Analysis for N→D			Analysis for N→C		Analysis for N→D d/	
	Total	Censored	Uncensored	Censored	Uncensored	Total	Censored	Uncensored	Censored	Uncensored
		N→N or D	N→C	N→N or C	N→D		N→N or D	N→C	N→N or C	N→D a/
II. Demographic status										
WHITE	0.938	0.939	0.933	0.938	0.934	0.925	0.906	1.000	0.925	-
	(0.242)	(0.239)	(0.251)	(0.241)	(0.250)	(0.264)	(0.292)	(0.000)	(0.264)	(-)
MALE	0.274	0.267	0.291	0.260	0.342	0.240	0.251	0.196	0.240	-
	(0.446)	(0.443)	(0.456)	(0.439)	(0.478)	(0.428)	(0.435)	(0.401)	(0.428)	(-)
MARRIED	0.272	0.258	0.306	0.260	0.329	0.272	0.246	0.373	0.272	-
	(0.445)	(0.438)	(0.463)	(0.439)	(0.473)	(0.446)	(0.432)	(0.488)	(0.446)	(-)
AGE	80.078	80.403	79.276	79.804	81.474	80.102	81.207	75.706	80.102	-
	(6.861)	(6.872)	(6.794)	(6.963)	(6.174)	(6.962)	(6.943)	(5.084)	(6.962)	(-)
HHOLD	1.978	1.988	1.955	1.956	2.092	2.047	2.069	1.961	2.047	-
	(1.215)	(1.230)	(1.182)	(1.188)	(1.348)	(1.297)	(1.370)	(0.958)	(1.297)	(-)
NCHILD	1.711	1.661	1.836	1.758	1.474	1.531	1.626	1.157	1.531	-
	(1.827)	(1.850)	(1.769)	(1.873)	(1.562)	(2.062)	(2.193)	(1.377)	(2.062)	(-)
III. Activities of Daily Living (ADLs) and Instrumental Activities of Daily Living (IADLs) limitations										
ADL1	0.237	0.245	0.216	0.227	0.289	0.213	0.217	0.196	0.213	-
	(0.426)	(0.431)	(0.413)	(0.419)	(0.457)	(0.410)	(0.413)	(0.401)	(0.410)	(-)
ADL2	0.144	0.142	0.149	0.144	0.145	0.146	0.163	0.078	0.146	-
	(0.352)	(0.350)	(0.358)	(0.352)	(0.354)	(0.353)	(0.370)	(0.272)	(0.353)	(-)
ADL3	0.041	0.036	0.052	0.039	0.053	0.024	0.030	0.000	0.024	-
	(0.198)	(0.187)	(0.223)	(0.193)	(0.225)	(0.152)	(0.170)	(0.000)	(0.152)	(-)
ADL4	0.084	0.085	0.082	0.088	0.066	0.051	0.059	0.020	0.051	-
	(0.278)	(0.279)	(0.276)	(0.283)	(0.250)	(0.221)	(0.236)	(0.140)	(0.221)	(-)
ADL5	0.155	0.152	0.164	0.160	0.132	0.102	0.103	0.098	0.102	-
	(0.362)	(0.359)	(0.372)	(0.367)	(0.340)	(0.304)	(0.305)	(0.300)	(0.304)	(-)
IADLS	0.970	0.979	0.948	0.966	0.987	0.874	0.897	0.784	0.874	-
	(0.171)	(0.144)	(0.223)	(0.180)	(0.115)	(0.332)	(0.305)	(0.415)	(0.332)	(-)

TABLE 2-4 - Continued

Mean (Standard deviation)

	1982-1984					1984-1989				
	Total sample in a nursing home between the 1982 and 1984 NLTCS used for					Total sample in a nursing home between the 1982 and 1984 NLTCS used for				
		Analysis for N→C		Analysis for N→D			Analysis for N→C		Analysis for N→D d/	
	Total	Censored	Uncensored	Censored	Uncensored	Total	Censored	Uncensored	Censored	Uncensored
		N→N or D	N→C	N→N or C	N→D		N→N or D	N→C	N→N or C	N→D a/
IV. Health status other than ADLs and IADLs										
SENILE	0.196	0.230	0.112	0.183	0.263	0.114	0.138	0.020	0.114	-
	(0.397)	(0.422)	(0.316)	(0.387)	(0.443)	(0.319)	(0.346)	(0.140)	(0.319)	(-)
CANCER	0.073	0.079	0.060	0.059	0.145	0.016	0.015	0.020	0.016	-
	(0.261)	(0.270)	(0.238)	(0.236)	(0.354)	(0.125)	(0.121)	(0.140)	(0.125)	(-)
STROKE	0.121	0.106	0.157	0.121	0.118	0.067	0.079	0.020	0.067	-
	(0.326)	(0.308)	(0.365)	(0.327)	(0.325)	(0.250)	(0.270)	(0.140)	(0.250)	(-)
LUNG	0.177	0.155	0.231	0.180	0.158	0.110	0.089	0.196	0.110	-
	(0.382)	(0.362)	(0.423)	(0.385)	(0.367)	(0.314)	(0.285)	(0.401)	(0.314)	(-)
HIPBREAK	0.056	0.048	0.075	0.059	0.039	0.012	0.015	0.000	0.012	-
	(0.230)	(0.215)	(0.264)	(0.236)	(0.196)	(0.108)	(0.121)	(0.000)	(0.108)	(-)
NEUROL	0.095	0.100	0.082	0.106	0.039	0.031	0.034	0.020	0.031	-
	(0.293)	(0.300)	(0.276)	(0.308)	(0.196)	(0.175)	(0.183)	(0.140)	(0.175)	(-)
V. Utilization and accessibility of acute medical care services										
PRIHOSP	0.422	0.412	0.448	0.423	0.421	0.185	0.172	0.235	0.185	-
	(0.494)	(0.493)	(0.499)	(0.495)	(0.497)	(0.389)	(0.379)	(0.428)	(0.389)	(-)
URBAN	0.422	0.391	0.500	0.420	0.434	0.402	0.404	0.392	0.402	-
	(0.494)	(0.489)	(0.502)	(0.494)	(0.499)	(0.491)	(0.492)	(0.493)	(0.491)	(-)
VII. Economic status										
LOG_FINC	5.729	5.741	5.699	5.712	5.818	5.682	5.628	5.896	5.682	-
	(2.299)	(2.252)	(2.419)	(2.309)	(2.260)	(2.180)	(2.216)	(2.039)	(2.180)	(-)
LOG_ASST	1.791	1.629	2.187	1.849	1.492	1.485	1.411	1.779	1.485	-
	(3.191)	(3.036)	(3.524)	(3.249)	(2.874)	(2.892)	(2.823)	(3.164)	(2.892)	(-)
OWNHOME	0.422	0.403	0.470	0.418	0.447	0.165	0.153	0.216	0.165	-
	(0.494)	(0.491)	(0.501)	(0.494)	(0.501)	(0.372)	(0.361)	(0.415)	(0.372)	(-)

TABLE 2-4 - Continued

Notes:

a/ N→N or D and N→N or C stand for elderly persons who were treated as censored in the competing-risks model, representing those who stay in a nursing home (N→N); or who were deceased (D) or who discharge from a nursing home to the community (C) between interviews of the 1982 and 1984; and 1984 and 1989 NLTCS. N→N and N→D stand for those who were treated as uncensored in the regression model, representing those who were discharged from a nursing home to the community and who died in the intervals between two surveys.

b/ Measured in 1982 for Medicaid reimbursement rate and weekly wage; in 1985 for Medicaid-certified nursing home beds; and in 1983 for others.

c/ Changes in interaction terms of a Medicaid dummy; and Medicaid reimbursement rate, the number of Medicaid-certified nursing home beds, and weekly wage are based on a change in the number of Medicaid eligibles from 1982 through 1984, but not based on changes in the reimbursement rate, the number of Medicaid certified nursing home beds, and weekly wage, themselves, for which information is not available in 1984.

d/ No observations who died in a nursing home between interviews of the 1984 and 1989 NLTCS.

TABLE 2-5: EXPLANATORY VARIABLES FOR ESTIMATING PROBABILITIES OF NURSING HOME ENTRY AND DEATH IN THE COMMUNITY IN 1982-1989: MEANS AND STANDARD DEVIATIONS, BY CENSORING STATUS [ALL MEASURED IN 1982 EXCEPT FOR STATE POLICY VARIABLES]

	Mean (Standard deviation)					
		Analysis for C→N		Analysis for C→D		
	Total	Censored	Uncensored	Censored	Uncensored	
		C→C or D	C→N	C→C or N	C→D	a/
Number of observations	3125	2310	815	2268	857	
LOSC_M	51.413	57.270	34.811	65.188	14.957	
	(32.483)	(33.900)	(20.402)	(25.844)	(15.761)	
LOSN_M	-	-	-	-	-	
	(-)	(-)	(-)	(-)	(-)	
I. State policy b/						
MEDICAID	0.264	0.258	0.283	0.270	0.250	
	(0.441)	(0.437)	(0.451)	(0.444)	(0.433)	
M_NEEDY	0.604	0.587	0.653	0.598	0.621	
	(0.489)	(0.492)	(0.476)	(0.490)	(0.485)	
H_WAIVER	0.771	0.771	0.773	0.761	0.799	
	(0.420)	(0.421)	(0.419)	(0.427)	(0.401)	
PAS1	0.580	0.568	0.613	0.572	0.601	
	(0.494)	(0.495)	(0.487)	(0.495)	(0.490)	
PAS2	0.084	0.084	0.081	0.087	0.075	
	(0.277)	(0.278)	(0.273)	(0.282)	(0.263)	
MEDLGRAT	0.859	0.838	0.918	0.874	0.820	
	(1.439)	(1.429)	(1.465)	(1.443)	(1.427)	
MEDLGBED	1.027	0.998	1.109	1.052	0.963	
	(1.719)	(1.699)	(1.770)	(1.735)	(1.673)	
LG_PRICE	5.081	5.088	5.059	5.070	5.111	
	(0.516)	(0.478)	(0.610)	(0.546)	(0.423)	

TABLE 2-5 - Continued

	Mean (Standard deviation)					
	Total	Analysis for C→N		Analysis for C→D		
		Censored C→C or D	Uncensored C→N	Censored C→C or N	Uncensored C→D	a/
II. Demographic status						
WHITE	0.869	0.844	0.940	0.877	0.847	
	(0.338)	(0.363)	(0.238)	(0.329)	(0.360)	
MALE	0.346	0.377	0.256	0.306	0.453	
	(0.476)	(0.485)	(0.437)	(0.461)	(0.498)	
MARRIED	0.428	0.478	0.286	0.426	0.433	
	(0.495)	(0.500)	(0.452)	(0.495)	(0.496)	
AGE	76.639	75.774	79.091	75.683	79.168	
	(7.479)	(7.411)	(7.122)	(7.053)	(7.974)	
HHOLD	2.084	2.143	1.918	2.007	2.291	
	(1.221)	(1.241)	(1.145)	(1.144)	(1.384)	
NCHILD	2.249	2.375	1.891	2.317	2.068	
	(2.195)	(2.240)	(2.021)	(2.219)	(2.121)	
III. Activities of Daily Living (ADLs) and Instrumental Activities of Daily Living (IADLs) limitations						
ADL1	0.242	0.241	0.244	0.246	0.231	
	(0.428)	(0.428)	(0.430)	(0.431)	(0.422)	
ADL2	0.110	0.100	0.136	0.107	0.118	
	(0.313)	(0.301)	(0.343)	(0.309)	(0.323)	
ADL3	0.032	0.032	0.032	0.027	0.044	
	(0.175)	(0.175)	(0.176)	(0.162)	(0.206)	
ADL4	0.066	0.061	0.081	0.057	0.090	
	(0.248)	(0.239)	(0.273)	(0.232)	(0.286)	
ADL5	0.102	0.096	0.119	0.071	0.183	
	(0.302)	(0.294)	(0.324)	(0.257)	(0.387)	
IADLS	0.890	0.870	0.946	0.866	0.952	
	(0.313)	(0.336)	(0.226)	(0.340)	(0.214)	

TABLE 2-5 - Continued

	Mean (Standard deviation)				
		Analysis for C→N		Analysis for C→D	
	Total	Censored	Uncensored	Censored	Uncensored
		C→C or D	C→N	C→C or N	C→D a/
IV. Health status other than ADLs and IADLs					
SENILE	0.094	0.075	0.147	0.068	0.162
	(0.292)	(0.264)	(0.355)	(0.252)	(0.369)
CANCER	0.066	0.071	0.054	0.039	0.138
	(0.249)	(0.256)	(0.226)	(0.194)	(0.345)
STROKE	0.069	0.060	0.093	0.053	0.111
	(0.253)	(0.238)	(0.291)	(0.224)	(0.314)
LUNG	0.245	0.269	0.178	0.229	0.287
	(0.430)	(0.443)	(0.383)	(0.420)	(0.453)
HIPBREAK	0.025	0.018	0.044	0.026	0.021
	(0.155)	(0.132)	(0.206)	(0.159)	(0.143)
NEUROL	0.050	0.041	0.074	0.048	0.054
	(0.217)	(0.199)	(0.261)	(0.214)	(0.226)
V. Utilization and accessibility of acute medical care services					
PRIHOSP	0.347	0.348	0.346	0.302	0.466
	(0.476)	(0.476)	(0.476)	(0.459)	(0.499)
URBAN	0.419	0.418	0.422	0.405	0.455
	(0.493)	(0.493)	(0.494)	(0.491)	(0.498)
VI. Economic status					
LOG_FINC	5.933	5.969	5.830	5.933	5.932
	(2.035)	(2.000)	(2.128)	(1.993)	(2.144)
LOG_ASST	1.679	1.635	1.805	1.717	1.580
	(3.055)	(3.015)	(3.163)	(3.084)	(2.975)
OWNHOME	0.539	0.573	0.442	0.545	0.522
	(0.499)	(0.495)	(0.497)	(0.498)	(0.500)

TABLE 2-5 - Continued

Notes:

a/ C→C or D and C→C or N stand for elderly persons who were treated as censored in the competing-risks model, representing those who stay in the community (C→C); or who died (D) or who entered nursing homes (N) between interviews of the 1982 and 1989 NLTCS. C→N and C→D stand for those who were treated as uncensored in the regression model, representing those who entered nursing homes from the community and who died in the intervals between two surveys.

b/ Measured in 1982 for Medicaid reimbursement rate and weekly wage; in 1985 for Medicaid-certified nursing home beds; and in 1983 for others.

TABLE 2-6: TIME-VARYING EXPLANATORY VARIABLES FOR ESTIMATING PROBABILITIES OF NURSING HOME ENTRY AND DEATH IN THE COMMUNITY: MEANS AND STANDARD DEVIATIONS, BY CENSORING STATUS

Variable	Mean (Standard deviation)														
				Analysis for C→N						Analysis for C→D					
	Total			Censored			Uncensored			Censored			Uncensored		
				C→C or D			C→N			C→C or N			C→D a/		
Number of observations	1985			1667			318			1859			126		
	Mean	Std. Dev	%change 1982-1989	Mean	Std. Dev	%change 1982-1989	Mean	Std. Dev	%change 1982-1989	Mean	Std. Dev	%change 1982-1989	Mean	Std. Dev	%change 1982-1989
LOSC_M	76.074	15.817		79.034	14.009		60.553	15.703		78.516	10.465		40.040	30.746	
I. Time-unvarying covariates															
M_NEEDY	0.590	0.492		0.579	0.494		0.648	0.478		0.587	0.493		0.635	0.483	
H_WAIVER	0.764	0.425		0.761	0.427		0.780	0.415		0.762	0.426		0.794	0.406	
PAS1	0.567	0.496		0.560	0.497		0.607	0.489		0.563	0.496		0.635	0.483	
PAS2	0.091	0.287		0.092	0.289		0.085	0.279		0.089	0.285		0.111	0.316	
WHITE	0.862	0.344		0.849	0.358		0.931	0.254		0.857	0.350		0.944	0.230	
MALE	0.314	0.464		0.329	0.470		0.236	0.425		0.311	0.463		0.357	0.481	
URBAN	0.405	0.491		0.404	0.491		0.409	0.492		0.401	0.490		0.460	0.500	
LOG_FINC	5.915	1.994		5.957	1.964		5.696	2.136		5.907	1.995		6.031	1.993	
II. Time-varying covariates															
MEDICAID82	0.268	0.443	16.384	0.267	0.442	16.405	0.270	0.445	16.279	0.264	0.441	17.347	0.325	0.470	4.878
MEDICAID84	0.311	0.463		0.311	0.463		0.314	0.465		0.309	0.462		0.341	0.476	
MEDLGRAT82 b/	0.867	1.440	16.326	0.866	1.440	16.323	0.872	1.439	16.340	0.853	1.432	17.320	1.061	1.538	4.531
MEDLGRAT84 b/	1.008	1.506		1.007	1.506		1.014	1.505		1.001	1.503		1.109	1.552	
MEDLGBED82 b/	1.043	1.730	16.192	1.039	1.726	16.120	1.063	1.753	16.564	1.027	1.722	17.140	1.272	1.844	4.903
MEDLGBED84 b/	1.211	1.807		1.206	1.802		1.239	1.837		1.203	1.804		1.334	1.867	
LG_PRICE82 b/	5.052	0.612	-25.197	5.044	0.641	-24.653	5.097	0.432	-28.023	5.056	0.599	-25.300	4.996	0.791	-23.670
LG_PRICE84 b/	3.779	2.259		3.801	2.245		3.669	2.330		3.777	2.261		3.813	2.235	

TABLE 2-6- Continued

Variable	Mean (Standard deviation)														
	Total			Analysis for C→N						Analysis for C→D					
				Censored C→C or D			Uncensored C→N			Censored C→C or N			Uncensored C→D a/		
	Mean	Std. Dev	%change 1982-1989	Mean	Std. Dev	%change 1982-1989	Mean	Std. Dev	%change 1982-1989	Mean	Std. Dev	%change 1982-1989	Mean	Std. Dev	%change 1982-1989
MARRIED82	0.453	0.498	-10.778	0.485	0.500	-10.630	0.286	0.453	-12.088	0.460	0.499	-7.827	0.349	0.479	-68.182
MARRIED84	0.405	0.491		0.434	0.496		0.252	0.435		0.424	0.494		0.111	0.316	
AGE82	74.887	6.828	2.671	74.272	6.643	2.693	78.107	6.893	2.561	74.579	6.625	2.682	79.429	8.092	2.518
AGE84	76.887	6.828		76.272	6.643		80.107	6.893		76.579	6.625		81.429	8.092	
HHOLD82	2.002	1.135	4.933	2.031	1.128	4.756	1.849	1.158	5.952	2.008	1.150	6.002	1.913	0.877	-11.618
HHOLD84	2.100	1.194		2.127	1.188		1.959	1.218		2.128	1.195		1.690	1.113	
NCHILD82	2.407	2.243	-23.817	2.488	2.254	-23.867	1.981	2.136	-23.492	2.434	2.264	-23.873	2.016	1.868	-22.835
NCHILD84	1.834	2.164		1.894	2.179		1.516	2.056		1.853	2.180		1.556	1.895	
ADL821	0.248	0.432	-14.402	0.241	0.428	-12.189	0.286	0.453	-24.176	0.250	0.433	-11.183	0.222	0.417	-67.857
ADL841	0.213	0.409		0.212	0.409		0.217	0.413		0.222	0.416		0.071	0.259	
ADL822	0.098	0.297	-0.515	0.097	0.295	-9.317	0.104	0.305	42.424	0.095	0.294	5.085	0.135	0.343	-58.823
ADL842	0.097	0.296		0.088	0.283		0.148	0.355		0.100	0.300		0.056	0.230	
ADL823	0.026	0.158	-11.765	0.028	0.164	-19.565	0.016	0.125	59.999	0.024	0.152	2.273	0.056	0.230	-100.000
ADL843	0.023	0.149		0.022	0.147		0.025	0.157		0.024	0.154		0.000	0.000	
ADL824	0.048	0.215	-4.167	0.047	0.213	-10.127	0.053	0.225	23.529	0.045	0.207	2.410	0.103	0.305	-46.154
ADL844	0.046	0.210		0.043	0.202		0.066	0.249		0.046	0.209		0.056	0.230	
ADL825	0.057	0.232	1.770	0.058	0.234	-13.402	0.050	0.219	93.750	0.046	0.209	30.588	0.222	0.417	-85.714
ADL845	0.058	0.234		0.050	0.219		0.097	0.297		0.060	0.237		0.032	0.176	
IADL82	0.847	0.360	-3.331	0.837	0.370	-3.513	0.899	0.301	-2.448	0.839	0.367	-3.590	0.960	0.196	0.000
IADL84	0.819	0.385		0.807	0.394		0.877	0.329		0.809	0.393		0.960	0.196	
SENILE82	0.041	0.199	17.073	0.031	0.174	19.231	0.094	0.293	13.333	0.036	0.186	23.881	0.119	0.325	-13.333
SENILE84	0.048	0.215		0.037	0.189		0.107	0.309		0.045	0.207		0.103	0.305	
CANCER82	0.038	0.191	13.333	0.037	0.189	24.194	0.041	0.198	-38.462	0.033	0.178	14.754	0.111	0.316	7.143
CANCER84	0.043	0.203		0.046	0.210		0.025	0.157		0.038	0.190		0.119	0.325	
STROKE82	0.044	0.206	7.954	0.041	0.198	5.883	0.063	0.243	15.000	0.037	0.188	10.294	0.159	0.367	0.000
STROKE84	0.048	0.214		0.043	0.203		0.072	0.259		0.040	0.197		0.159	0.367	
LUNG82	0.240	0.427	-7.563	0.256	0.437	-6.557	0.154	0.362	-16.327	0.237	0.425	-8.163	0.278	0.450	0.000
LUNG84	0.222	0.415		0.239	0.427		0.129	0.336		0.218	0.413		0.278	0.450	

TABLE 2-6- Continued

Variable	Mean (Standard deviation)														
				Analysis for C→N						Analysis for C→D					
	Total			Censored			Uncensored			Censored			Uncensored		
				C→C or D			C→N			C→C or N			C→D		a/
	Mean	Std. Dev	%change 1982-1989	Mean	Std. Dev	%change 1982-1989	Mean	Std. Dev	%change 1982-1989	Mean	Std. Dev	%change 1982-1989	Mean	Std. Dev	%change 1982-1989
HIPBK82	0.021	0.142	-56.098	0.019	0.135	-54.839	0.031	0.175	-60.000	0.020	0.140	-56.757	0.032	0.176	-50.000
HIPBK84	0.009	0.095		0.008	0.091		0.013	0.112		0.009	0.092		0.016	0.125	
NEUROL82	0.037	0.189	-1.351	0.036	0.186	5.000	0.044	0.205	-28.572	0.036	0.185	0.000	0.063	0.245	-12.500
NEUROL84	0.037	0.188		0.038	0.191		0.031	0.175		0.036	0.185		0.056	0.230	
PRIHOSP82	0.282	0.450	-9.660	0.287	0.452	-9.205	0.255	0.436	-12.346	0.274	0.446	-11.176	0.389	0.489	6.122
PRIHOSP84	0.254	0.436		0.260	0.439		0.223	0.417		0.244	0.429		0.413	0.494	
LOG_ASSET82	1.681	3.044	-8.021	1.679	3.056	-7.519	1.691	2.985	-10.629	1.676	3.031	-3.971	1.747	3.252	-65.350
LOG_ASSET84	1.546	2.933		1.552	2.943		1.512	2.887		1.610	2.973		0.605	2.065	
OWNHOME82	0.568	0.496	-46.051	0.584	0.493	-42.710	0.481	0.500	-67.320	0.576	0.494	-47.432	0.444	0.499	-19.643
OWNHOME84	0.306	0.461		0.335	0.472		0.157	0.365		0.303	0.460		0.357	0.481	

Notes:

a/ C→C or D and C→C or N stand for elderly persons who were treated as censored in the competing-risks model, representing those who stay in the community (C→C); or who died (D) or who entered nursing homes (N) between the interviews of the 1982 and 1984 NLTCS. C→N and C→D stand for those who were treated as uncensored in the regression model, representing those who entered nursing homes from the community and who died between the two survey periods.

b/ Changes in interaction terms of a Medicaid dummy; and Medicaid reimbursement rate, the number of Medicaid-certified nursing home beds, and weekly wage are based on a change in the number of Medicaid eligibles from 1982 through 1984, but not based on changes in the reimbursement rate, the number of Medicaid certified nursing home beds, and weekly wage, themselves, for which information is not available in 1984.

TABLE 3-1-1: SEMI-PARAMETRIC HAZARDS ESTIMATES FOR TRANSITION PROBABILITIES OF ELDERLY PERSONS FROM THE COMMUNITY TO A NURSING HOME IN TWO PERIODS: 1982-1984 AND 1984-1989 (COX-PROPORTIONAL HAZARDS ESTIMATES) [ESTIMATED BY PHREG IN SAS]

	1982-1984				1984-1989			
	MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)		MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)	
	Coefficient (Wald Chi-square)	% effect of a covariate a/	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate
MEDICAID	2.1177 (1.2738)	731.2	- (-)	-	-3.3735 (1.7039)	-96.6	- (-)	-
M_NEEDY	- (-)	-	0.2421 ** (6.2093)	27.4 **	- (-)	-	0.2613 ** (3.9794)	29.9 **
H_WAIVER	- (-)	-	-0.2216 * (3.0030)	-19.9 *	- (-)	-	-0.0239 (0.0195)	-2.4
PAS1	- (-)	-	0.0748 (0.4831)	7.8	- (-)	-	0.1441 (1.0719)	15.5
PAS2	- (-)	-	-0.1841 (1.2818)	-16.8	- (-)	-	-0.0187 (0.0077)	-1.9
MEDLGRAT	-0.4314 (1.5881)	-35.0	-0.1872 (0.6670)	-17.1	0.0371 (0.0067)	3.8	-0.6054 * (3.4302)	-45.4 *
MEDLGBED	-0.1649 (0.2656)	-15.2	0.1706 (0.8032)	18.6	0.7739 * (3.0185)	116.8 *	0.4506 * (2.8105)	56.9 *
LG_PRICE	-0.1559 ** (6.4528)	-14.4 **	-0.1468 ** (5.9631)	-13.7 **	-0.0655 ** (2.7744)	-6.3 **	-0.0654 * (2.7856)	-6.3 *
WHITE	0.9047 ** (23.2250)	147.1 **	0.8334 ** (19.4644)	130.1 **	1.0119 ** (19.2731)	175.1 **	0.9709 ** (17.5547)	164.0 **
MALE	0.0352 (0.1063)	3.6	0.0420 (0.1517)	4.3	0.0778 (0.2714)	8.1	0.0790 (0.2794)	8.2
MARRIED	-0.4253 ** (13.0565)	-34.6 **	-0.4395 ** (13.9152)	-35.6 **	-0.2975 * (2.8063)	-25.7 *	-0.2983 * (2.7747)	-25.8 *
AGE	0.0319 ** (26.1851)	3.2 **	0.0317 ** (25.6909)	3.2 **	0.0508 ** (34.0836)	5.2 **	0.0510 ** (33.8697)	5.2 **

TABLE 3-1-1- Continued

	1982-1984				1984-1989			
	MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)		MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)	
	Coefficient (Wald Chi-square)	% effect of a covariate a/	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate
HHOLD	-0.1295 **	-12.1 **	-0.1228 **	-11.6 **	-0.1510 **	-14.0 **	-0.1484 **	-13.8 **
	(9.8887)		(9.0476)		(7.6539)		(7.4062)	
NCHILD	-0.1045 **	-9.9 **	-0.1005 **	-9.6 **	-0.0719 **	-6.9 **	-0.0654 **	-6.3 **
	(20.4737)		(18.8449)		(5.9154)		(4.8050)	
ADL1	0.0654	6.8	0.0599	6.2	0.0832	8.7	0.0908	9.5
	(0.3062)		(0.2566)		(0.3004)		(0.3560)	
ADL2	0.3866 **	47.2 **	0.3757 **	45.6 **	0.3702 **	44.8 **	0.3765 **	45.7 **
	(8.4170)		(7.9295)		(4.4634)		(4.6145)	
ADL3	0.5507 **	73.4 **	0.5310 **	70.1 **	0.2887	33.5	0.3320	39.4
	(5.6351)		(5.2249)		(0.6132)		(0.8055)	
ADL4	0.5002 **	64.9 **	0.5175 **	67.8 **	0.3837	46.8	0.4410 *	55.4 *
	(9.6412)		(10.3353)		(2.4121)		(3.1567)	
ADL5	0.7338 **	108.3 **	0.7551 **	112.8 **	0.5262 **	69.2 **	0.5110 **	66.7 **
	(26.2974)		(27.9065)		(5.6879)		(5.3024)	
IADLS	1.0234 **	178.3 **	1.0083 **	174.1 **	0.1201	12.8	0.0983	10.3
	(15.5622)		(15.0925)		(0.4236)		(0.2827)	
SENILE	0.4108 **	50.8 **	0.4411 **	55.4 **	0.9445 **	157.1 **	0.9864 **	168.1 **
	(10.4216)		(11.9308)		(21.0608)		(22.4983)	
CANCER	0.2159	24.1	0.2498	28.4	-0.4152	-34.0	-0.3916	-32.4
	(1.4274)		(1.9011)		(1.3195)		(1.1711)	
STROKE	0.3847 **	46.9 **	0.3641 **	43.9 **	0.6209 **	86.1 **	0.6202	85.9
	(7.1343)		(6.3427)		(7.2631)		(7.2567) **	**
LUNG	-0.2796 **	-24.4 **	-0.2729 **	-23.9 **	-0.5811 **	-44.1 **	-0.5687	-43.4
	(6.3118)		(6.0205)		(11.4844)		(10.9789) **	**

TABLE 3-1-1- Continued

	1982-1984				1984-1989			
	MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)		MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)	
	Coefficient (Wald Chi-square)	% effect of a covariate a/	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate
HIPBREAK	0.3968 **	48.7 **	0.4047 **	49.9 **	0.2945	34.3	0.3402	40.5
	(4.0264)		(4.1618)		(0.3274)		(0.4370)	
NEUROL	0.3600 **	43.3 **	0.3980 **	48.9 **	-0.1632	-15.1	-0.1148	-10.8
	(5.4554)		(6.6300)		(0.2458)		(0.1208)	
PRIHOSP	0.2606 **	29.8 **	0.2732 **	31.4 **	-0.1286	-12.1	-0.1265	-11.9
	(8.0580)		(8.8422)		(0.8371)		(0.8102)	
URBAN	-0.0581	-5.6	-0.0924	-8.8	-0.1105	-10.5	-0.1388	-13.0
	(0.4339)		(1.0748)		(0.8737)		(1.3478)	
LOG_FINC	0.0115	1.2	0.0147	1.5	-0.0202	-2.0	-0.0177	-1.8
	(0.2956)		(0.4809)		(0.5513)		(0.4192)	
LOG_ASST	0.0237 *	2.4 *	0.0235	2.4	0.0097	1.0	0.0075	0.8
	(2.7328)		(2.6795)		(0.2172)		(0.1278)	
OWNHOME	-0.1272	-11.9	-0.1072	-10.2	-0.4318 **	-35.1 **	-0.4258 **	-34.7 **
	(1.8239)		(1.2732)		(5.0327)		(4.7862)	
Log-likelihood	-349.890		-358.595		-215.663		-463.214	
-2Log-Likelihood	8,354.698		8,345.992		4,525.970		4,525.970	
-2Log-Likelihood (Slope = 0)	8,704.587		8,704.587		4,741.633		4,741.633	
Observation(total)	4,547		4,547		1,985		1,985	
Uncensored	558		558		318		318	
Censored	3,989		3,989		1,667		1,667	

Notes:

(): Wald chi-square.

Significance: * indicates 5% < p < 10%, and ** indicates p ≤ 5%.

a/ The % effect of a covariate = (exp(β)-1)*100%.

TABLE 3-1-2: SEMI-PARAMETRIC HAZARDS ESTIMATES FOR TRANSITION PROBABILITIES OF ELDERLY PERSONS FROM THE COMMUNITY TO DEATH IN TWO PERIODS: 1982-1984 AND 1984-1989 (COX-PROPORTIONAL HAZARDS ESTIMATES) [ESTIMATED BY PHREG IN SAS]

	1982-1984				1984-1989			
	MODEL I Mortality in the community (C→D)		MODEL II Mortality in the community (C→D)		MODEL I Mortality in the community (C→D)		MODEL II Mortality in the community (C→D)	
	Coefficient (Wald Chi-square)	% effect of a covariate a/	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate
MEDICAID	-0.5449 (0.0972)	-42.0	- (-)	-	-5.1173 (1.8087)	-99.4	- (-)	-
M_NEEDY	- (-)	-	0.0649 (0.6981)	6.7	- (-)	-	0.0488 (0.0563)	5.0
H_WAIVER	- (-)	-	0.0675 (0.4134)	7.0	- (-)	-	-0.2841 (1.0854)	-24.7
PAS1	- (-)	-	0.1054 (1.4925)	11.1	- (-)	-	0.3977 * (2.9587)	48.8 *
PAS2	- (-)	-	-0.2086 (2.2566)	-18.8	- (-)	-	-0.0232 (0.0056)	-2.3
MEDLGRAT	0.3940 (1.9170)	48.3	0.2395 (1.6174)	27.1	0.3627 (0.2959)	43.7	-0.2869 (0.3164)	-24.9
MEDLGBED	-0.2316 (0.5739)	-20.7	-0.2396 (2.2196)	-21.3	1.0276 (2.0905)	179.4	0.2707 (0.4108)	31.1
LG_PRICE	0.0634 (0.5295)	6.5	0.0406 (0.2340)	4.1	0.0196 (0.1292)	2.0	0.0258 (0.2235)	2.6
WHITE	-0.2356 ** (5.2246)	-21.0 **	-0.2639 ** (6.3440)	-23.2 **	1.1361 ** (7.9225)	211.5 **	1.0995 ** (7.3371)	200.3 **
MALE	0.4950 ** (37.3761)	64.0 **	0.4982 ** (37.7758)	64.6 **	0.4139 * (3.7303)	51.3 *	0.3980 * (3.3874)	48.9 *
MARRIED	-0.0706 (0.6144)	-6.8	-0.0736 (0.6634)	-7.1	-2.1673 ** (42.7607)	-88.6 **	-2.1917 ** (43.6184)	-88.8 **
AGE	0.0419 ** (69.9919)	4.3 **	0.0420 ** (70.3358)	4.3 **	0.0656 ** (24.3064)	6.8 **	0.0645 ** (23.0780)	6.7 **

TABLE 3-1-2 - Continued

	1982-1984				**1984-1989**			
	MODEL I		MODEL II		MODEL I		MODEL II	
	Mortality in the community (C→D)		Mortality in the community (C→D)		Mortality in the community (C→D)		Mortality in the community (C→D)	
	Coefficient (Wald Chi-square)	% effect of a covariate a/	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate
HHOLD	0.0948 **	9.9 **	0.0958 **	10.1 **	-0.1412	-13.2	-0.1372	-12.8
	(12.7647)		(13.0103)		(2.5173)		(2.3290)	
NCHILD	-0.0555 **	-5.4 **	-0.0531 **	-5.2 **	0.0055	0.5	0.0127	1.3
	(10.4798)		(9.5649)		(0.0135)		(0.0705)	
ADL1	0.2265 **	25.4 **	0.2232 **	25.0 **	-1.4821 **	-77.3 **	-1.4853 **	-77.4 **
	(5.4700)		(5.2973)		(17.5093)		(17.5501)	
ADL2	0.2741 **	31.5 **	0.2655 **	30.4 **	-1.0021 **	-63.3 **	-0.9992 **	-63.2 **
	(5.0617)		(4.7314)		(6.3671)		(6.3310)	
ADL3	0.6290 **	87.6 **	0.6260 **	87.0 **	-16.1599	-100.0	-16.1459	-100.0
	(12.5196)		(12.3839)		(0.0001)		(0.0001)	
ADL4	0.4022 **	49.5 **	0.4102 **	50.7 **	-0.4869	-38.5	-0.5035	-39.6
	(8.5713)		(8.9033)		(1.4547)		(1.4951)	
ADL5	0.6949 **	100.4 **	0.7045 **	102.3 **	-1.0261 **	-64.2 **	-1.0112 **	-63.6 **
	(38.0509)		(38.9362)		(3.7894)		(3.6680)	
IADLS	0.5348 **	70.7 **	0.5291 **	69.7 **	1.4322 **	318.8 **	1.4236 **	315.2 **
	(9.6300)		(9.4198)		(9.3763)		(9.2496)	
SENILE	0.2425 **	27.4 **	0.2514 **	28.6 **	0.1497	16.1	0.1671	18.2
	(5.3496)		(5.7396)		(0.1938)		(0.2400)	
CANCER	1.0229 **	178.1 **	1.0111 **	174.9 **	0.4105	50.8	0.4637	59.0
	(98.5405)		(95.8468)		(1.6886)		(2.1313)	
STROKE	0.2273 **	25.5 **	0.2231 *	25.0 *	0.6498 **	91.5 **	0.6388 **	89.4 **
	(3.8409)		(3.6940)		(5.4835)		(5.2981)	
LUNG	0.1774 **	19.4 **	0.1831 **	20.1 **	0.2568	29.3	0.2404	27.2
	(4.9072)		(5.2122)		(1.4084)		(1.2435)	

TABLE 3-1-2 - Continued

	1982-1984				1984-1989			
	MODEL I Mortality in the community (C→D)		MODEL II Mortality in the community (C→D)		MODEL I Mortality in the community (C→D)		MODEL II Mortality in the community (C→D)	
	Coefficient (Wald Chi-square)	% effect of a covariate a/	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate
HIPBREAK	-0.4589 *	-36.8 *	-0.4477 *	-36.1 *	-0.2029	-18.4	-0.0912	-8.7
	(3.3532)		(3.1953)		(0.0761)		(0.0155)	
NEUROL	-0.0479	-4.7	-0.0301	-3.0	0.5105	66.6	0.5407	71.7
	(0.0914)		(0.0359)		(1.5704)		(1.7165)	
PRIHOSP	0.4494 **	56.7 **	0.4525 **	57.2 **	0.6238 **	86.6 **	0.6210 **	86.1 **
	(36.6153)		(36.9054)		(9.8739)		(9.5924)	
URBAN	0.0768	8.0	0.0656	6.8	0.1270	13.5	0.1188	12.6
	(1.1140)		(0.7931)		(0.4306)		(0.3692)	
LOG_FINC	0.0184	1.9	0.0185	1.9	0.0420	4.3	0.0474	4.9
	(1.1882)		(1.1903)		(0.6769)		(0.8571)	
LOG_ASST	-0.0087	-0.9	-0.0078	-0.8	-0.1060 **	-10.1 **	-0.1099 **	-10.4 **
	(0.4963)		(0.3968)		(4.5841)		(4.9106)	
OWNHOME	0.1730 **	18.9 **	0.1940 **	21.4 **	1.3182 **	273.7 **	1.3342 **	279.7 **
	(4.8668)		(6.0230)		(33.0153)		(33.8009)	
Log-likelihood	-455.940		-461.734		-268.724		-270.139	
-2Log-Likelihood	13,164.045		13,158.251		1,575.663		1,574.247	
-2Log-Likelihood (Slope = 0)	13,619.985		13,619.985		1,844.386		1,844.386	
Observation(total)	4,547		4,547		1,985		1,985	
Uncensored	819		819		126		126	
Censored	3,728		3,728		1,859		1,859	

Note:
(): Wald Chi-square.
Significance: * indicates 5% < p < 10%, and ** indicates p ≤ 5%.
a/ The % effect of a covariate = (exp(β)-1)*100%.

TABLE 3-2-1: SEMI-PARAMETRIC HAZARDS ESTIMATES FOR TRANSITION PROBABILITIES OF ELDERLY PERSONS FROM A NURSING HOME TO THE COMMUNITY IN TWO PERIODS: 1982-1984 AND 1984-1989 (COX-PROPORTIONAL HAZARDS ESTIMATES) [ESTIMATED BY PHREG IN SAS]

	1982-1984				1984-1989			
	MODEL I NH discharge risk (N→C)		MODEL II NH discharge risk (N→C)		MODEL I NH discharge risk (N→C)		MODEL II NH discharge risk (N→C)	
	Coefficient (Wald Chi-square)	% effect of a covariate a/	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate
MEDICAID	4.1486 (0.9638)	6234.2			13.4137 (1.2608)	66911130.0		
M_NEEDY			0.1960 (0.8362)	21.6			0.1322 (0.1076)	14.1
H_WAIVER			-0.3732 (1.6717)	-31.1			0.1436 (0.0715)	15.4
PAS1			-0.0502 (0.0459)	-4.9			-0.4377 (0.9536)	-35.5
PAS2			0.4575 (1.8506)	58.0			-0.0577 (0.0117)	-5.6
MEDLGRAT	-0.8585 (1.0774)	-57.6	-0.0743 (0.0222)	-7.2	-3.6531 (2.2349)	-97.4	-1.7511 (1.5277)	-82.6
MEDLGBED	-0.3868 (0.3357)	-32.1	0.0196 (0.0022)	2.0	-0.7692 (0.1928)	-53.7	1.0866 (0.9006)	196.4
LG_PRICE	0.0518 (0.0865)	5.3	0.0329 (0.0340)	3.3	0.1020 (0.5912)	10.7	0.0881 0.5238	9.2
WHITE	-0.3962 (1.0825)	-32.7	-0.5218 (1.9037)	-40.7	18.3145 (0.0001)	8992227000.0	18.4143 0.0001	9936138600.0
MALE	-0.0654 (0.0901)	-6.3	-0.0361 (0.0274)	-3.5	-0.7032 (2.6860)	-50.5	-0.6951 2.4846	-50.1
MARRIED	0.1294 (0.2792)	13.8	0.1081 (0.1945)	11.4	-0.0597 (0.0208)	-5.8	0.0460 0.0117	4.7
AGE	-0.0209 (2.2593)	-2.1	-0.0229 * (2.7392)	-2.3 *	-0.1621 ** (26.7635)	-15.0 **	-0.1666 ** 26.4022	-15.4 **

TABLE 3-2-1 - Continued

	1982-1984				1984-1989			
	MODEL I NH discharge rısk (N→C)		MODEL II NH discharge risk (N→C)		MODEL I NH discharge risk (N→C)		MODEL II NH discharge risk (N→C)	
	Coefficient (Wald Chi-square)	% effect of a covariate a/	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate
HHOLD	-0.0064 (0.0061)	-0.6	-0.0042 (0.0027)	-0.4	0.0565 (0.1790)	5.8	0.0755 0.2996	7.8
NCHILD	0.0664 (1.9743)	6.9	0.0601 (1.6326)	6.2	-0.0044 (0.0016)	-0.4	-0.0162 0.0215	-1.6
ADL1	-0.1009 (0.1610)	-9.6	-0.1896 (0.5534)	-17.3	-0.9097 ** (3.8438)	-59.7 **	-0.9614 ** 3.8405	-61.8 **
ADL2	0.2633 (0.8491)	30.1	0.2323 (0.6542)	26.1	-0.0246 (0.0017)	-2.4	-0.0750 0.0148	-7.2
ADL3	0.1614 (0.1311)	17.5	0.1783 (0.1566)	19.5	-16.9932 (0.0000)	-100.0	-17.3118 0.0000	-100.0
ADL4	-0.0725 (0.0416)	-7.0	-0.0758 (0.0459)	-7.3	-0.9077 (0.5180)	-59.7	-1.0257 0.7009	-64.1
ADL5	0.3398 (1.4113)	40.5	0.3382 (1.3975)	40.2	-1.3123 ** (5.1136)	-73.1 **	-1.2721 ** 4.8130	-72.0 **
IADLS	-0.5505 (1.7305)	-42.3	-0.5332 (1.5668)	-41.3	-0.2483 (0.3276)	-22.0	-0.1982 0.1923	-18.0
SENILE	-0.9170 ** (9.9651)	-60.0 **	-0.9804 ** (11.1270)	-62.5 **	-2.2305 * (3.3152)	-89.3 *	-2.1713 * 3.3178	-88.6 *
CANCER	-0.1615 (0.1812)	-14.9	-0.1276 (0.1103)	-12.0	-0.3672 (0.0953)	-30.7	-0.2617 0.0424	-23.0
STROKE	0.3668 (1.7899)	44.3	0.3967 (2.0759)	48.7	-1.4093 (1.7543)	-75.6	-1.4443 1.8368	-76.4
LUNG	0.5069 ** (5.0125)	66.0 **	*0.4855* ** (4.6021)	62.5 **	*0.6935* (2.4101)	*100.1*	*0.7584* 2.6026	113.5

TABLE 3-2-1 - Continued

	1982-1984				1984-1989			
	MODEL I NH discharge risk (N→C)		MODEL II NH discharge risk (N→C)		MODEL I NH discharge risk (N→C)		MODEL II NH discharge risk (N→C)	
	Coefficient (Wald Chi-square)	% effect of a covariate a/	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate
HIPBREAK	0.4916	63.5	0.5380	71.3	-16.6251	-100.0	-16.5491	-100.0
	(1.8878)		(2.2657)		(0.0000)		0.0000	
NEUROL	-0.3861	-32.0	-0.4269	-34.7	-0.6880	-49.7	-0.6535	-48.0
	(1.3329)		(1.6364)		(0.3052)		0.2927	
PRIHOSP	-0.2186	-19.6	-0.2736	-23.9	-0.0206	-2.0	-0.1106	-10.5
	(1.2192)		(1.9383)		(0.0026)		0.0719	
URBAN	0.4472 **	56.4 **	0.5006 **	65.0 **	-0.0650	-6.3	-0.1033	-9.8
	(5.8233)		(6.9259)		(0.0379)		0.0941	
LOG_FINC	-0.0550	-5.4	-0.0584	-5.7	0.0106	1.1	-0.0062	-0.6
	(1.7541)		(1.9851)		(0.0168)		0.0054	
LOG_ASST	0.0532 *	5.5 *	0.0600 **	6.2 **	-0.0743	-7.2	-0.0883	-8.5
	(3.2544)		(4.0189)		(1.6777)		2.2187	
OWNHOME	-0.0862	-8.3	-0.1513	-14.0	0.0856	8.9	0.0487	5.0
	(0.1713)		(0.5098)		(0.0278)		0.0088	
Log-likelihood	-40.933		-44.075		-95.602		-95.545	
-2Log-Likelihood	1,506.794		1,503.652		392.375		392.432	
-2Log-Likelihood (Slope = 0)	1,547.726		1,547.726		487.977		487.977	
Observation(total)	464		464		254		254	
Uncensored	134		134		51		51	
Censored	330		330		203		203	

Note:

(): Wald Chi-square.

Significance: * indicates 5% < p < 10%, and ** indicates p ≤ 5%.

a/ The % effect of a covariate = $(\exp(\beta)-1)*100\%$.

TABLE 3-2-2: SEMI-PARAMETRIC HAZARDS ESTIMATES FOR TRANSITION PROBABILITIES OF ELDERLY PERSONS FROM A NURSING HOME TO DEATH IN TWO PERIODS: 1982-1984 AND 1984-1989 (COX-PROPORTIONAL HAZARDS ESTIMATES) [ESTIMATED BY PHREG IN SAS]

	1982-1984				1984-1989			
	MODEL I Mortality in a nursing home (N→D)		MODEL II Mortality in a nursing home (N→D)		MODEL I Mortality in a nursing home (N→D)		MODEL II Mortality in a nursing home (N→D)	
	Coefficient (Wald Chi-square)	% effect of a covariate a/	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate
MEDICAID	4.7790	11798.2	-	-	-	-	-	-
	(0.9612)		(-)		(-)		(-)	
M_NEEDY	-	-	0.4704	60.1	-	-	-	-
	(-)		(2.4601)		(-)		(-)	
H_WAIVER	-	-	0.0145	1.5	-	-	-	-
	(-)		(0.0013)		(-)		(-)	
PAS1	-	-	-0.2387	-21.2	-	-	-	-
	(-)		(0.5565)		(-)		(-)	
PAS2	-	-	0.0261	2.6	-	-	-	-
	(-)		(0.0031)		(-)		(-)	
MEDLGRAT	-0.3882	-32.2	0.2608	29.8	-	-	-	-
	(0.1627)		(0.1731)		(-)		(-)	
MEDLGBED	-0.8058	-55.3	-0.1295	-12.1	-	-	-	-
	(1.0477)		(0.0621)		(-)		(-)	
LG_PRICE	-0.0207	-2.0	-0.0562	-5.5	-	-	-	-
	(0.0183)		(0.1345)		(-)		(-)	
WHITE	0.1548	16.7	-0.0331	-3.3	-	-	-	-
	(0.0953)		(0.0043)		(-)		(-)	
MALE	0.0903	9.5	0.0980	10.3	-	-	-	-
	(0.0927)		(0.1082)		(-)		(-)	
MARRIED	0.3959	48.6	0.3970	48.7	-	-	-	-
	(1.4335)		(1.3968)		(-)		(-)	
AGE	0.0363 *	3.7 *	0.0323 *	3.3 *	-	-	-	-
	(3.8235)		(2.9193)		(-)		(-)	

TABLE 3-2-2 - Continued

	1982-1984				1984-1989			
	MODEL I		MODEL II		MODEL I		MODEL II	
	Mortality in a nursing home (N→D)		Mortality in a nursing home (N→D)		Mortality in a nursing home (N→D)		Mortality in a nursing home (N→D)	
	Coefficient (Wald Chi-square)	% effect of a covariate a/	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate
HHOLD	0.0826 (0.5644)	8.6	0.0968 (0.7719)	10.2	- (-)	-	- (-)	-
NCHILD	-0.1064 (1.9507)	-10.1	-0.0923 (1.4877)	-8.8	- (-)	-	- (-)	-
ADL1	0.4097 (1.6548)	50.6	0.3061 (0.9093)	35.8	- (-)	-	- (-)	-
ADL2	-0.0141 (0.0013)	-1.4	-0.1443 (0.1363)	-13.4	- (-)	-	- (-)	-
ADL3	0.1152 (0.0381)	12.2	0.1978 (0.1090)	21.9	- (-)	-	- (-)	-
ADL4	-0.3321 (0.4135)	-28.3	-0.3649 (0.5054)	-30.6	- (-)	-	- (-)	-
ADL5	-0.4517 (1.2143)	-36.3	-0.4545 (1.2229)	-36.5	- (-)	-	- (-)	-
IADLS	0.4897 (0.2240)	63.2	0.3603 (0.1202)	43.4	- (-)	-	- (-)	-
SENILE	0.1134 (0.1465)	12.0	0.1182 (0.1571)	12.5	- (-)	-	- (-)	-
CANCER	0.9290 ** (6.7438)	153.2 **	1.0940 ** (8.6453)	198.6 **	- (-)	-	- (-)	-
STROKE	-0.0422 (0.0113)	-4.1	-0.1086 (0.0732)	-10.3	- (-)	-	- (-)	-
LUNG	-0.1542 (0.2057)	-14.3	-0.2339 (0.4651)	-20.9	- (-)	-	- (-)	-

TABLE 3-2-2 - Continued

	1982-1984				1984-1989			
	MODEL I Mortality in a nursing home (N→D)		MODEL II Mortality in a nursing home (N→D)		MODEL I Mortality in a nursing home (N→D)		MODEL II Mortality in a nursing home (N→D)	
	Coefficient (Wald Chi-square)	% effect of a covariate a/	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate
HIPBREAK	-0.1215	-11.4	-0.0501	-4.9	-	-	-	-
	(0.0385)		(0.0065)		(-)		(-)	
NEUROL	-1.0153 *	-63.8 *	-1.0546 *	-65.2 *	-	-	-	-
	(2.7943)		(2.9457)		(-)		(-)	
PRIHOSP	0.1153	12.2	0.0704	7.3	-	-	-	-
	(0.1811)		(0.0685)		(-)		(-)	
URBAN	-0.0048	-0.5	-0.0333	-3.3	-	-	-	-
	(0.0004)		(0.0167)		(-)		(-)	
LOG_FINC	0.0512	5.3	0.0438	4.5	-	-	-	-
	(0.7901)		(0.5757)		(-)		(-)	
LOG_ASST	-0.0373	-3.7	-0.0380	-3.7	-	-	-	-
	(0.7347)		(0.7582)		(-)		(-)	
OWNHOME	0.3436	41.0	0.3215	37.9	-	-	-	-
	(1.3897)		(1.1851)		(-)		(-)	

Log-likelihood	-27.781	-29.862
-2Log-Likelihood	811.915	809.834
-2Log-Likelihood (Slope = 0)	839.696	839.696
Observation(total)	464	464
Uncensored	76	76
Censored	388	388

Note:
(): Wald Chi-square.
Significance: * indicates 5% < p < 10%, and ** indicates p ≤ 5%.
a/ The % effect of a covariate = (exp(β)-1)*100%.

TABLE 3-3-1: PARAMETRIC HAZARDS ESTIMATES WITH HETEROGENEITY FOR TRANSITION PROBABILITIES OF ELDERLY PERSONS FROM THE COMMUNITY TO A NURSING HOME IN TWO PERIODS: 1982-1984 AND 1984-1989 (WEIBULL-GAMMA DISTRIBUTION)

	1982-1984				1984-1989			
	MODEL I		MODEL II		MODEL I		MODEL II	
	NH entry risk (C→N)		NH entry risk (C→N)		NH entry risk (C→N)		NH entry risk (C→N)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
CONSTANT	-51.0812 **	1943.6170	-55.9081 **	1953.2380	-11.8439 **	185.8021	-12.2377 **	184.9236
MEDICAID	3.7392	1.6041	-	-	-3.3615	1.7729	-	-
M_NEEDY	-	-	0.4763 **	7.4761	-	-	0.2547 **	3.8818
H_WAIVER	-	-	-0.4547 **	3.8429	-	-	-0.0211	0.0158
PAS1	-	-	0.1309	0.4691	-	-	0.1377	1.0178
PAS2	-	-	-0.3210	1.3440	-	-	-0.0136	0.0042
MEDLGRAT	-0.8617	2.5333	-0.5145	1.7004	0.0513	0.0137	-0.5898 *	3.3819
MEDLGBED	-0.2224	0.1969	0.4305	1.7554	0.7639 *	3.0760	0.4412 *	2.7946
LG_PRICE	-0.1965 **	4.6270	-0.1780 *	3.6115	-0.0611	2.5581	-0.0621	2.5851
WHITE	1.5484 **	20.7804	1.5427 **	17.1266	0.9684 **	18.2859	0.9445 **	16.7479
MALE	0.0126	0.0049	0.0313	0.0253	0.0707	0.2396	0.0739	0.2535
MARRIED	-0.6618 **	11.0958	-0.7606 **	12.2597	-0.2919 *	2.8560	-0.2946 *	2.7873
AGE	0.0487 **	22.5444	0.0520 **	21.3808	0.0491 **	28.4855	0.0498 **	28.4409
HHOLD	-0.1944 **	8.1314	-0.1919 **	6.8615	-0.1436 **	7.3190	-0.1430 **	7.0898
NCHILD	-0.1663 **	17.9464	-0.1755 **	16.8964	-0.0696 **	5.7398	-0.0642 **	4.6600
ADL1	0.1363	0.4681	0.1416	0.4253	0.0734	0.2511	0.0829	0.3101
ADL2	0.6839 **	9.7909	0.7366 **	9.6906	0.3488 **	4.1801	0.3605 **	4.3575
ADL3	0.7739 **	4.3455	0.7040 *	2.9227	0.2684	0.5661	0.3158	0.7595
ADL4	0.7957 **	9.4467	0.9448 **	11.3200	0.3532	2.1659	0.4157 *	2.8945
ADL5	1.0928 **	21.7278	1.2261 **	23.6352	0.5127 **	5.3646	0.5024 **	4.9909
IADLS	1.9098 **	15.7436	2.0658 **	15.3970	0.1200	0.4538	0.0988	0.2980
SENILE	0.6406 **	10.0827	0.7839 **	12.7003	0.9222 **	18.3285	0.9712 **	19.4283
CANCER	0.2290	0.6339	0.3138	1.0039	-0.3953	1.2846	-0.3759	1.1278
STROKE	0.5203 **	5.7406	0.5271 **	5.0689	0.6113 **	6.8570	0.6143 **	6.8091

TABLE 3-3-1 - Continued

	1982-1984				1984-1989			
	MODEL I		MODEL II		MODEL I		MODEL II	
	NH entry risk		NH entry risk		NH entry risk		NH entry risk	
	(C→N)		(C→N)		(C→N)		(C→N)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
LUNG	-0.4434 **	5.6458	-0.4518 **	4.9416	-0.5561 **	11.0843	-0.5535 **	10.6218
HIPBREAK	0.7608 **	7.0458	0.8255 **	7.1462	0.2569	0.2634	0.3073	0.3690
NEUROL	0.6066 **	7.2152	0.7670 **	9.9432	-0.1700	0.2798	-0.1214	0.1382
PRIHOSP	0.4110 **	7.4209	0.4785 **	8.5811	-0.1217	0.8022	-0.1204	0.7651
URBAN	-0.1105	0.5969	-0.1959	1.5654	-0.1093	0.9044	-0.1372	1.3580
LOG_FINC	0.0227	0.4416	0.0320	0.7705	-0.0210	0.6112	-0.0186	0.4589
LOG_ASST	0.0269	1.3288	0.0257	1.0242	0.0093	0.2103	0.0071	0.1182
OWNHOME	-0.2473	2.5711	-0.2111	1.5542	-0.4062 **	4.7464	-0.4102 **	4.6102
σ	0.0762		0.0697		0.6376		0.6271	
θ	1.8872		2.0633		0.9394		0.9621	
Likelihood	-860.472		-855.339		-939.024		-936.912	

Note:

Significance: * indicates 5% < p < 10%, and ** indicates p ≤ 5%.

TABLE 3-3-2: PARAMETRIC HAZARDS ESTIMATES WITH HETEROGENEITY FOR TRANSITION PROBABILITIES OF ELDERLY PERSONS FROM THE COMMUNITY TO DEATH IN TWO PERIODS: 1982-1984 AND 1984-1989 (WEIBULL-GAMMA DISTRIBUTION)

	1982-1984				1984-1989			
	MODEL I		MODEL II		MODEL I		MODEL II	
	Mortality in the community (C→D)		Mortality in the community (C→D)		Mortality in the community (C→D)		Mortality in the community (C→D)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
CONSTANT	-6.3260 **	229.3218	-6.4508 **	231.8933	-11.4823 **	79.1200	-11.6145 **	77.9773
MEDICAID	-0.0913	0.0066	-	-	-2.7116	0.6418	-	-
M_NEEDY	-	-	0.0351	0.4561	-	-	0.0625	0.1148
H_WAIVER	-	-	0.0540	0.6095	-	-	-0.1917	0.6581
PAS1	-	-	0.0356	0.3766	-	-	0.3154	2.5255
PAS2	-	-	-0.1105	1.4654	-	-	0.0698	0.0685
MEDLGRAT	0.2920	2.3036	0.2259 *	2.8559	0.3152	0.2998	-0.0546	0.0159
MEDLGBED	-0.2477	1.5293	-0.2156 *	3.5997	0.4737	0.5877	0.0904	0.0627
LG_PRICE	0.0368	0.4913	0.0272	0.2653	0.0530	1.2321	0.0527	1.1991
WHITE	-0.1423 **	4.2355	-0.1562 **	4.8001	1.0161 **	8.9744	0.9677 **	7.9422
MALE	0.3456 **	39.1778	0.3493 **	39.0661	0.5251 **	8.1524	0.5183 **	7.7531
MARRIED	-0.0636	1.1361	-0.0633	1.0946	-2.1606 **	47.0308	-2.1986 **	46.9650
AGE	0.0280 **	68.4072	0.0285 **	68.4991	0.0643 **	29.2318	0.0643 **	28.4217
HHOLD	0.0613 **	10.8152	0.0632 **	11.2270	-0.1621 **	4.1776	-0.1597 **	3.8814
NCHILD	-0.0395 **	12.2926	-0.0389 **	11.5364	-0.0077	0.0371	-0.0002	0.0000
ADL1	0.1327 **	4.5578	0.1363 **	4.6626	-1.3290 **	19.5853	-1.3353 **	19.3520
ADL2	0.1549 *	3.7998	0.1560 *	3.7422	-1.0731 **	10.3923	-1.0775 **	10.3139
ADL3	0.4100 **	10.9597	0.4146 **	10.9520	-16.9582	0.0000	-16.9189	0.0000
ADL4	0.2563 **	7.7007	0.2657 **	8.0709	-0.6872 **	3.9628	-0.7036 **	4.0127
ADL5	0.5028 **	40.1093	0.5125 **	40.6234	-1.1327 **	6.5710	-1.1451 **	6.5984
IADLS	0.3029 **	9.1522	0.3049 **	8.9478	1.3256 **	11.9027	1.3331 **	11.7659
SENILE	0.1663 **	4.9256	0.1724 **	5.1724	0.2515	0.7162	0.2929	0.9485
CANCER	0.7349 **	82.8542	0.7415 **	82.4839	0.4383	2.4345	0.4695 *	2.7112
STROKE	0.1608 *	3.7326	0.1606 *	3.6482	0.8263 **	11.1979	0.8263 **	11.0162

TABLE 3-3-2 - Continued

	1982-1984				1984-1989			
	MODEL I		MODEL II		MODEL I		MODEL II	
	Mortality in the community (C→D)		Mortality in the community (C→D)		Mortality in the community (C→D)		Mortality in the community (C→D)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
LUNG	0.1388 **	6.6646	0.1420 **	6.7884	0.2420	1.7037	0.2399	1.6618
HIPBREAK	-0.3151 *	3.7454	-0.3194 *	3.7310	-0.1268	0.0377	-0.0631	0.0094
NEUROL	-0.0639	0.3521	-0.0532	0.2370	0.5071	2.0187	0.5254	2.0872
PRIHOSP	0.3115 **	38.2520	0.3166 **	38.4199	0.6865 **	14.6037	0.6959 **	14.7637
URBAN	0.0753	2.4375	0.0706	2.0380	0.1299	0.6149	0.1289	0.5903
LOG_FINC	0.0094	0.6869	0.0096	0.7032	0.0559	1.6149	0.0610	1.8565
LOG_ASST	-0.0046	0.3155	-0.0045	0.2864	-0.0967 **	5.6086	-0.0992 **	5.7343
OWNHOME	0.0936 *	3.2595	0.1049 **	3.9338	1.4595 **	46.2595	1.4896 **	46.4163
σ	1.4782		1.4541		2.2861		2.2637	
θ	0.1612		0.1935		0.7420		0.7520	
Likelihood	-2,682.101		-2,680.310		-551.250		-549.984	

Note:

Significance: * indicates 5% < p < 10%, and ** indicates p ≤ 5%.

TABLE 3-4-1: PARAMETRIC HAZARDS ESTIMATES WITH HETEROGENEITY FOR TRANSITION PROBABILITIES OF ELDERLY PERSONS FROM A NURSING HOME TO THE COMMUNITY IN TWO PERIODS: 1982-1984 AND 1984-1989 (WEIBULL-GAMMA DISTRIBUTION)

	1982-1984				1984-1989			
	MODEL I NH discharge risk (N→C)		MODEL II NH discharge risk (N→C)		MODEL I NH discharge risk (N→C)		MODEL II NH discharge risk (N→C)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
CONSTANT	1.8983	0.0348	-0.7950	0.6991	-27.8521	1.7800E-13	-35.5549 *	2.8061
MEDICAID	22.8613	0.8607	-	-	264.9952	2.3171	-	-
M_NEEDY	-	-	0.1407	1.3672	-	-	-0.6249	0.0309
H_WAIVER	-	-	-0.1198	0.4820	-	-	3.1235	0.3521
PAS1	-	-	-0.0304	0.0473	-	-	-4.7731	1.1142
PAS2	-	-	0.2531	1.5633	-	-	2.4187	0.3945
MEDLGRAT	-3.1177	0.4442	-0.2503	0.5802	-58.3638 *	3.2894	-23.7256	2.7059
MEDLGBED	-3.5469	0.8025	0.2019	0.5467	-22.6122	0.8102	16.7415	2.2415
LG_PRICE	0.1556	0.0259	0.0781	0.6613	1.4767	1.7734	1.3793	1.5990
WHITE	-2.6341	1.5298	-0.1680	0.5319	96.5230	2.1400E-12	103.0208	-
MALE	0.7143	0.3594	0.0360	0.0588	-6.5381 *	3.4990	-6.5464 **	4.2280
MARRIED	0.4117	0.0978	-0.0403	0.0682	-6.4145	2.2267	-4.0759	1.0673
AGE	-0.1659 **	4.7953	-0.0020	0.0465	-1.5348 **	20.3972	-1.4368 **	26.0673
HHOLD	-0.0889	0.0401	0.0342	0.5768	0.5946	0.2641	0.8276	0.7696
NCHILD	0.4633 **	4.0087	0.0220	0.4930	-0.0006	0.0000	0.1394	0.0240
ADL1	-1.6302	1.4311	0.0563	0.1456	-7.4650 *	2.9358	-8.5180 *	3.2410
ADL2	0.2322	0.0248	0.1934	1.2750	1.3038	0.0480	0.1439	0.0006
ADL3	0.0022	0.0000	0.0955	0.1161	-85.3077	3.2100E-16	-89.8884	-
ADL4	-1.0828	0.2981	-0.1718	0.6572	-1.2475	0.0094	-2.4720	0.0440
ADL5	2.0571	1.5838	0.1833	1.1927	-6.7483 *	2.7383	-7.3149 *	3.6088
IADLS	-2.1486	1.0514	-0.3462	1.2846	-4.3276	1.0777	-3.5910	0.9573
SENILE	-5.3862 **	9.8095	-0.4807 **	7.6038	-24.4183 *	3.6155	-21.4481 *	3.4428
CANCER	-2.2989	1.1611	0.0178	0.0076	6.0266	1.0542	3.1189	0.2342
STROKE	1.2608	0.6741	0.2055	1.3821	-15.6606	1.8264	-13.9223	1.6837

TABLE 3-4-1 - Continued

	1982-1984				1984-1989			
	MODEL I		MODEL II		MODEL I		MODEL II	
	NH discharge risk (N→C)		NH discharge risk (N→C)		NH discharge risk (N→C)		NH discharge risk (N→C)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
LUNG	2.7948 **	4.7591	0.3401 **	5.4176	9.6530 **	9.5970	9.2980 **	7.3945
HIPBREAK	3.1257	2.2861	0.2620	1.2123	-98.6262	3.3200E-15	-105.8889	5.4900E-15
NEUROL	-3.3286 *	2.9124	-0.2255	1.3570	-3.1707	0.0464	6.2202	0.2695
PRIHOSP	-1.5875	1.9045	-0.1396	1.4465	2.2861	0.5512	1.6048	0.1686
URBAN	3.1438 **	9.0862	0.2312 **	4.2624	0.7028	0.0518	0.0586	0.0003
LOG_FINC	-0.2568	1.1938	-0.0046	0.0328	-0.6645	0.9720	-0.7004	1.3401
LOG_ASST	0.2792 *	2.7090	0.0194	1.1616	-0.4986	0.4871	-0.5412	0.6728
OWNHOME	-0.3349	0.0766	0.0208	0.0296	0.7269	0.0222	-0.5751	0.0146
σ	0.2946		3.0645		0.0758		0.0853	
θ	6.8122		-0.9651		11.4517		10.2333	
Likelihood	- 471.891		-456.385		-109.944		-110.770	

Note:

Significance: * indicates 5% < p < 10%, and ** indicates p ≤ 5%.

TABLE 3-4-2: PARAMETRIC HAZARDS ESTIMATES WITH HETEROGENEITY FOR TRANSITION PROBABILITIES OF ELDERLY PERSONS FROM A NURSING HOME TO DEATH IN TWO PERIODS: 1982-1984 AND 1984-1989 (WEIBULL-GAMMA DISTRIBUTION)

	1982-1984				1984-1989			
	MODEL I		MODEL II		MODEL I		MODEL II	
	Mortality in a nursing home (N→D)		Mortality in a nursing home (N→D)		Mortality in a nursing home (N→D)		Mortality in a nursing home (N→D)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
CONSTANT	-121.0778 **	11.6849	-109.0799 **	8.6127	-	-	-	-
MEDICAID	117.7000	2.0321	-	-	-	-	-	-
M_NEEDY	-	-	7.6285	2.5923	-	-	-	-
H_WAIVER	-	-	0.4379	0.0056	-	-	-	-
PAS1	-	-	-3.1739	0.3782	-	-	-	-
PAS2	-	-	-1.9585	0.0710	-	-	-	-
MEDLGRAT	-13.5517	0.7784	3.1351	0.1186	-	-	-	-
MEDLGBED	-16.9560	1.6736	-0.9607	0.0164	-	-	-	-
LG_PRICE	0.0611	0.0012	-0.9135	0.2422	-	-	-	-
WHITE	6.6749	0.7792	3.8976	0.2843	-	-	-	-
MALE	1.4718	0.0966	1.7230	0.1462	-	-	-	-
MARRIED	7.1357	1.6967	8.2577	2.3778	-	-	-	-
AGE	0.5220 *	3.3703	0.4916 *	2.8809	-	-	-	-
HHOLD	0.5200	0.0882	0.2380	0.0193	-	-	-	-
NCHILD	-1.4364	1.3889	-1.3073	1.1250	-	-	-	-
ADL1	5.5437	1.3253	2.8208	0.3301	-	-	-	-
ADL2	-0.4828	0.0064	-3.4831	0.3378	-	-	-	-
ADL3	-3.7803	0.1593	-0.6056	0.0047	-	-	-	-
ADL4	-5.2937	0.3913	-5.5033	0.4681	-	-	-	-
ADL5	-6.9657	1.3666	-8.0443	1.7796	-	-	-	-
IADLS	6.8113	0.1376	4.9281	0.0765	-	-	-	-
SENILE	1.4271	0.0954	2.2273	0.2474	-	-	-	-
CANCER	14.2791 **	7.9051	16.3260 **	9.3054	-	-	-	-
STROKE	-1.0957	0.0287	-2.5464	0.1636	-	-	-	-

TABLE 3-4-2 - Continued

	1982-1984				1984-1989			
	MODEL I		MODEL II		MODEL I		MODEL II	
	Mortality in a nursing home (N→D)		Mortality in a nursing home (N→D)		Mortality in a nursing home (N→D)		Mortality in a nursing home (N→D)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
LUNG	-2.0925	0.1556	-4.1890	0.6125	-	-	-	-
HIPBREAK	-1.2293	0.0157	0.2433	0.0006	-	-	-	-
NEUROL	-14.9997	2.1465	-15.0661	2.1285	-	-	-	-
PRIHOSP	-0.7698	0.0296	-0.4068	0.0090	-	-	-	-
URBAN	0.3320	0.0067	-0.7251	0.0327	-	-	-	-
LOG_FINC	0.8262	0.8860	0.7160	0.6234	-	-	-	-
LOG_ASST	-0.4294	0.3986	-0.6278	0.8973	-	-	-	-
OWNHOME	4.5568	1.0085	4.5923	1.0474	-	-	-	-
σ	0.0760		0.0772		-	-	-	-
θ	18.1994		17.6359		-	-	-	-
Likelihood	-248.353		-249.248					

Note:

Significance: * indicates 5% < p < 10%, and ** indicates p ≤ 5%.

TABLE 3-5: SEMI-PARAMETRIC HAZARDS ESTIMATES FOR TRANSITION PROBABILITIES OF ELDERLY PERSONS FROM THE COMMUNITY TO A NURSING HOME OR DEATH IN 1982-1989, USING EXPLANATORY VARIABLES MEASURED IN 1982 (COX-PROPORTIONAL HAZARDS ESTIMATES) [ESTIMATED BY PHREG IN SAS]

	MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)		MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)	
	Coefficient (Wald Chi-square)	% effect of a covariate a/	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate
MEDICAID	0.5140 (0.1016)	67.2	- (-)	-	-1.1020 (0.4545)	-66.8	- (-)	-
M_NEEDY	- (-)	-	0.2260 ** (7.7046)	25.4 **	- (-)	-	0.0239 (0.0965)	2.4
H_WAIVER	- (-)	-	-0.0998 (0.8883)	-9.5	- (-)	-	0.1101 (1.1349)	11.6
PAS1	- (-)	-	0.1667 * (3.5215)	18.1 *	- (-)	-	0.1280 (2.2572)	13.7
PAS2	- (-)	-	-0.1355 (0.9886)	-12.7	- (-)	-	-0.1275 (0.8810)	-12.0
MEDLGRAT	-0.0446 (0.0239)	-4.4	-0.0957 (0.2348)	-9.1	0.5816 ** (4.2290)	78.9 **	0.3459 * (3.1911)	41.3 *
MEDLGBED	-0.0594 (0.0457)	-5.8	0.1159 (0.5010)	12.3	-0.2303 (0.6438)	-20.6	-0.3138 * (3.6159)	-26.9 *
LG_PRICE	-0.0817 (1.9160)	-7.8	-0.0978 * (2.8388)	-9.3 *	0.1188 (1.8173)	12.6	0.0962 (1.2570)	10.1
WHITE	0.9740 ** (40.2668)	164.8 **	0.8983 ** (34.1088)	145.5 **	-0.1994 ** (3.8704)	-18.1 **	-0.2240 ** (4.6667)	-20.1 **
MALE	0.1179 (1.6986)	12.5	0.1196 (1.7430)	12.7	0.5952 ** (54.8414)	81.3 **	0.5986 ** (55.0404)	82.0 **
MARRIED	-0.3204 ** (10.6470)	-27.4 **	-0.3358 ** (11.5849)	-28.5 **	-0.0598 (0.4442)	-5.8	-0.0622 (0.4760)	-6.0
AGE	0.0557 ** (108.4600)	5.7 **	0.0556 ** (106.8703)	5.7 **	0.0527 ** (113.0683)	5.4 **	0.0529 ** (113.3410)	5.4 **

TABLE 3-5- Continued

	MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)		MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)	
	Coefficient (Wald Chi-square)	% effect of a covariate a/	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate
HHOLD	-0.1391 **	-13.0 **	-0.1346 **	-12.6 **	0.1058 **	11.2 **	0.1044 **	11.0 **
	(16.1193)		(15.2410)		(15.4298)		(15.0294)	
NCHILD	-0.0900 **	-8.6 **	-0.0836 **	-8.0 **	-0.0484 **	-4.7 **	-0.0460 **	-4.5 **
	(22.9200)		(19.5761)		(8.1860)		(7.3898)	
ADL1	0.0164	1.7	0.0065	0.7	0.1853 **	20.4 **	0.1886 **	20.8 **
	(0.0316)		(0.0049)		(3.8425)		(3.9737)	
ADL2	0.2601 **	29.7 **	0.2385 **	26.9 **	0.2905 **	33.7 **	0.2776 **	32.0 **
	(5.2483)		(4.4049)		(6.0433)		(5.4753)	
ADL3	0.2547	29.0	0.2307	25.9	0.5064 **	65.9 **	0.4923 **	63.6 **
	(1.4772)		(1.2091)		(8.1250)		(7.6625)	
ADL4	0.4109 **	50.8 **	0.4193 **	52.1 **	0.4732 **	60.5 **	0.4887 **	63.0 **
	(8.3728)		(8.6821)		(12.6443)		(13.4308)	
ADL5	0.5619 **	75.4 **	0.5850 **	79.5 **	0.6579 **	93.1 **	0.6611 **	93.7 **
	(17.7686)		(19.1813)		(33.4766)		(33.7053)	
IADLS	0.7541 **	112.6 **	0.7494 **	111.6 **	0.5902 **	80.4 **	0.5865 **	79.8 **
	(22.2737)		(21.9580)		(12.5906)		(12.4299)	
SENILE	0.6484 **	91.3 **	0.6664 **	94.7 **	0.1547	16.7	0.1748 *	19.1 *
	(32.4261)		(34.3443)		(2.1567)		(2.7497)	
CANCER	0.2509	28.5	0.2609 *	29.8 *	0.9917 **	169.6 **	0.9841 **	167.5 **
	(2.5397)		(2.7439)		(93.1311)		(91.1268)	
STROKE	0.6098 **	84.0 **	0.5918 **	80.7 **	0.2546 **	29.0 **	0.2527 **	28.8 **
	(22.9622)		(21.4790)		(4.9330)		(4.8567)	
LUNG	-0.2776 **	-24.2 **	-0.2808 **	-24.5 **	0.2711 **	31.1 **	0.2793 **	32.2 **
	(8.6892)		(8.8879)		(12.0541)		(12.7528)	

TABLE 3-5- Continued

	MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)		MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)	
	Coefficient (Wald Chi-square)	% effect of a covariate a/	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate
HIPBREAK	0.1477	15.9	0.1286	13.7	-0.5717 **	-43.5 **	-0.5952 **	-44.9 **
	(0.6864)		(0.5157)		(5.5601)		(5.9931)	
NEUROL	0.3038 **	35.5 **	0.3453 **	41.2 **	-0.1425	-13.3	-0.1212	-11.4
	(4.7773)		(6.0140)		(0.8432)		(0.6059)	
PRIHOSP	0.1818 **	19.9 **	0.2001 **	22.2 **	0.4654 **	59.3 **	0.4741 **	60.7 **
	(5.4221)		(6.5618)		(40.1478)		(41.3941)	
URBAN	-0.0395	-3.9	-0.0724	-7.0	0.1233 *	13.1 *	0.1228 *	13.1 *
	(0.2874)		(0.9353)		(3.0047)		(2.8867)	
LOG_FINC	-0.0132	-1.3	-0.0110	-1.1	0.0028	0.3	0.0015	0.2
	(0.5456)		(0.3803)		(0.0269)		(0.0084)	
LOG_ASST	0.0293 **	3.0 **	0.0283 **	2.9 **	-0.0085	-0.8	-0.0081	-0.8
	(5.6644)		(5.2930)		(0.4795)		(0.4353)	
OWNHOME	-0.2255 **	-20.2 **	-0.1996 **	-18.1 **	0.0974	10.2	0.1205	12.8
	(8.5076)		(6.5680)		(1.6147)		(2.4357)	
Log-likelihood	-587.532		-600.024		-558.108		-564.597	
-2Log-Likelihood	11,751.533		11,739.042		12,877.979		12,871.490	
-2Log-Likelihood (Slope = 0)	12,339.066		12,339.066		13,436.087		13,436,087	
Observation(total)	3,125		3,125		3,125		3,125	
Uncensored	815		815		857		857	
Censored	2,310		2,310		2,268		2,268	

Notes:

(): Wald Chi-square.

Significance: * indicates 5% < p < 10%, and ** indicates p ≤ 5%.

a/ The % effect of a covariate = (exp(β)-1)*100%.

TABLE 3-6: PARAMETRIC HAZARDS ESTIMATES WITH HETEROGENEITY FOR TRANSITION PROBABILITIES OF ELDERLY PERSONS FROM THE COMMUNITY TO A NURSING HOME OR DEATH IN 1982-1989, USING EXPLANATORY VARIABLES MEASURED IN 1982 (WEIBULL-GAMMA DISTRIBUTION)

	MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)		MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
CONSTANT	-7.0063 **	343.7559	-7.0519 **	339.0203	-5.4809 **	201.3995	-5.5866 **	205.3579
MEDICAID	0.4284	0.1792	-	-	-0.0393	0.0016	-	-
M_NEEDY	-	-	0.1514 **	9.1436	-	-	0.0129	0.0787
H_WAIVER	-	-	-0.0812	1.5020	-	-	0.0732	1.4349
PAS1	-	-	0.1130 **	4.0524	-	-	0.0130	0.0618
PAS2	-	-	-0.0492	0.3356	-	-	-0.0405	0.2538
MEDLGRAT	-0.0290	0.0236	-0.0275	0.0473	0.3345 *	3.5254	0.2834 **	5.1266
MEDLGBED	-0.0563	0.1073	0.0539	0.2625	-0.2854	2.6924	-0.2533 **	5.7605
LG_PRICE	-0.0591	1.9984	-0.0648	2.3641	0.0519	1.3995	0.0464	1.0856
WHITE	0.5496 **	46.5638	0.4905 **	35.8776	-0.1203 *	3.5858	-0.1217 *	3.5096
MALE	0.0705	1.6990	0.0679	1.5679	0.3657 **	55.3470	0.3669 **	54.8927
MARRIED	-0.2315 **	16.1508	-0.2368 **	16.8149	-0.0584	1.2428	-0.0553	1.1005
AGE	0.0339 **	97.6250	0.0338 **	96.6535	0.0332 **	113.7733	0.0336 **	115.6221
HHOLD	-0.0741 **	12.2349	-0.0727 **	11.7989	0.0454 **	6.7188	0.0469 **	7.0886
NCHILD	-0.0606 **	31.1721	-0.0602 **	30.3551	-0.0427 **	18.5933	-0.0422 **	17.7792
ADL1	0.0210	0.1329	0.0141	0.0596	0.0959 *	3.1412	0.0990 *	3.2989
ADL2	0.1888 **	6.4166	0.1743 **	5.4553	0.1521 **	4.5802	0.1527 **	4.5601
ADL3	0.3213 **	5.6115	0.3243 **	5.7202	0.3218 **	7.5984	0.3205 **	7.4658
ADL4	0.3466 **	13.4393	0.3516 **	13.7425	0.2707 **	9.8744	0.2781 **	10.2818
ADL5	0.4877 **	32.3139	0.4967 **	33.3694	0.4517 **	35.6039	0.4553 **	35.7360
IADLS	0.4746 **	32.7358	0.4786 **	33.2119	0.2895 **	13.4265	0.2897 **	13.1646
SENILE	0.3504 **	18.7469	0.3614 **	19.6893	0.1584 **	4.7725	0.1602 **	4.8207
CANCER	0.2066 **	3.9704	0.2198 **	4.4756	0.6070 **	57.6537	0.6119 **	58.3781
STROKE	0.3738 **	17.3570	0.3674 **	16.6619	0.1490 *	3.4073	0.1482 *	3.3357

TABLE 3-6- Continued

	MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)		MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
LUNG	-0.1045 *	3.4138	-0.1041 *	3.3564	0.1684 **	12.1286	0.1689 **	12.0496
HIPBREAK	0.0910	0.4658	0.1046	0.6166	-0.3592 **	6.6522	-0.3604 **	6.6070
NEUROL	0.2117 **	4.5243	0.2294 **	5.2583	-0.0816	0.7169	-0.0713	0.5388
PRIHOSP	0.1152 **	5.2679	0.1222 **	5.8929	0.3079 **	45.2467	0.3105 **	45.4378
URBAN	-0.0143	0.0942	-0.0379	0.6351	0.0922 **	4.6134	0.0931 **	4.5392
LOG_FINC	-0.0045	0.1554	-0.0021	0.0319	0.0005	0.0028	0.0004	0.0014
LOG_ASST	0.0184 **	5.5293	0.0182 **	5.3590	-0.0047	0.4032	-0.0051	0.4618
OWNHOME	-0.1406 **	8.1182	-0.1284 **	6.7156	0.0223	0.2408	0.0277	0.3611
σ	1.1391		1.1324		2.4378		2.4228	
θ	-0.4964		-0.4943		-0.5744		-0.5398	
Likelihood	-1,945.282		-1,938.473		-2,770.921		-2,769.546	

Note:

Significance: * indicates 5% < p < 10%, and ** indicates p ≤ 5%.

TABLE 3-7: SEMI-PARAMETRIC HAZARDS ESTIMATES WITH TIME-VARYING COVARIATES FOR TRANSITION PROBABILITIES OF ELDERLY PERSONS FROM THE COMMUNITY TO A NURSING HOME OR DEATH (COX-PROPORTIONAL HAZARDS ESTIMATES) [ESTIMATED BY PHREG IN SAS]

	MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)		MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)	
	Coefficient (Wald Chi-square)	% effect of a covariate a/	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate
MEDICAID	-3.2194 (1.5515)	-96.0	- (-)	-	-6.7244 ** (3.0385)	-99.9 **	- (-)	-
M_NEEDY	- (-)	-	0.2588 ** (3.8997)	29.5 **	- (-)	-	0.1061 (0.2452)	11.2
H_WAIVER	- (-)	-	-0.0277 (0.0262)	-2.7	- (-)	-	-0.2581 (0.8784)	-22.7
PAS1	- (-)	-	0.1316 (0.8922)	14.1	- (-)	-	0.4107 * (3.2710)	50.8 *
PAS2	- (-)	-	-0.0047 (0.0005)	-0.5	- (-)	-	0.2510 (0.6524)	28.5
MEDLGRAT	0.0136 (0.0009)	1.4	-0.6004 * (3.3529)	-45.1 *	0.8036 (1.3506)	123.4	-0.1051 (0.0420)	-10.0
MEDLGBED	0.7532 * (2.8566)	112.4 *	0.4460 * (2.7345)	56.2 *	0.9352 (1.8022)	154.8	-0.0127 (0.0009)	-1.3
LG_PRICE	-0.0672 * (2.8918)	-6.5 *	-0.0670 * (2.8927)	-6.5 *	-0.2376 ** (17.7575)	-21.1 **	-0.2333 ** (17.2274)	-20.8 **
WHITE	1.0198 ** (19.5376)	177.3 **	0.9783 ** (17.7757)	166.0 **	1.0865 ** (7.3070)	196.4 **	1.0539 ** (6.7866)	186.9 **
MALE	0.0824 (0.3030)	8.6	0.0833 (0.3093)	8.7	0.6858 ** (10.8030)	98.5 **	0.6549 ** (9.6204)	92.5 **
MARRIED	-0.3034 * (2.9102)	-26.2 *	-0.3012 * (2.8225)	-26.0 *	-1.6266 ** (25.0855)	-80.3 **	-1.6335 ** (25.3667)	-80.5 **
AGE	0.0508 ** (34.1507)	5.2 **	0.0511 ** (34.1299)	5.2 **	0.0821 ** (39.3135)	8.6 **	0.0813 ** (37.9320)	8.5 **

TABLE 3-7 - Continued

	MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)		MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)	
	Coefficient (Wald Chi-square)	% effect of a covariate a/	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate
HHOLD	-0.1539 **	-14.3 **	-0.1509 **	-14.0 **	-0.1307	-12.3	-0.1262	-11.9
	(7.9277)		(7.6495)		(2.3087)		(2.1495)	
NCHILD	-0.0718 **	-6.9 **	-0.0658 **	-6.4 **	-0.0777	-7.5	-0.0734	-7.1
	(5.8767)		(4.8408)		(2.4096)		(2.1503)	
ADL1	0.0733	7.6	0.0795	8.3	-1.7794 **	-83.1 **	-1.8068 **	-83.6 **
	(0.2346)		(0.2746)		(25.7202)		(26.4146)	
ADL2	0.3629 **	43.7 **	0.3657 **	44.1 **	-1.2580 **	-71.6 **	-1.2406 **	-71.1 **
	(4.2941)		(4.3657)		(9.9630)		(9.6799)	
ADL3	0.2973	34.6	0.3375	40.1	-16.1279	-100.0	-16.1792	-100.0
	(0.6518)		(0.8348)		(0.0001)		(0.0001)	
ADL4	0.3600	43.3	0.4124 *	51.0 *	-0.5675	-43.3	-0.5704	-43.5
	(2.1332)		(2.7759)		(1.9494)		(1.9659)	
ADL5	0.5035 **	65.5 **	0.4864 **	62.6 **	-1.2433 **	-71.2 **	-1.2304 **	-70.8 **
	(5.3880)		(4.9766)		(5.5608) **	**	(5.4492) **	**
IADLS	0.1277	13.6	0.1062	11.2	1.3968	304.2	1.3819	298.3
	(0.4799)		(0.3301)		(8.9846)		(8.7758)	
SENILE	0.9499 **	158.5 **	0.9911 **	169.4 **	-0.1322	-12.4	-0.0955	-9.1
	(21.3885)		(22.8049)		(0.1220)		(0.0634)	
CANCER	-0.4247	-34.6	-0.3981	-32.8	0.7198 **	105.4 **	0.7002 **	101.4 **
	(1.3828)		(1.2120)		(4.6693)		(4.4509)	
STROKE	0.6145 **	84.9 **	0.6130 **	84.6 **	0.8110 **	125.0 **	0.7920 **	120.8 **
	(7.1557)		(7.1280)		(7.4444)		(7.0819)	
LUNG	-0.5914 **	-44.6 **	-0.5801 **	-44.0 **	0.3510 *	42.0 *	0.3387	40.3
	(12.0094)		(11.5259)		(2.7462)		(2.5423)	

TABLE 3-7 - Continued

	MODEL I		MODEL II		MODEL I		MODEL II	
	NH entry risk (C→N)		NH entry risk (C→N)		NH entry risk (C→N)		NH entry risk (C→N)	
	Coefficient (Wald Chi-square)	% effect of a covariate a/	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate	Coefficient (Wald Chi-square)	% effect of a covariate
HIPBREAK	0.2635	30.2	0.3001	35.0	-0.2011	-18.2	-0.2945	-25.5
	(0.2657)		(0.3453)		(0.0764)		(0.1628)	
NEUROL	-0.1482	-13.8	-0.1053	-10.0	0.6036	82.9	0.5528	73.8
	(0.2028)		(0.1017)		(2.2547)		(1.8094)	
PRIHOSP	-0.1130	-10.7	-0.0936	-8.9	0.3172	37.3	0.3183	37.5
	(0.7470)		(0.5125)		(2.5390)		(2.5169)	
URBAN	-0.1047	-9.9	-0.1315	-12.3	0.1095	11.6	0.1149	12.2
	(0.7821)		(1.2091)		(0.3268)		(0.3489)	
LOG_FINC	-0.0204	-2.0	-0.0180	-1.8	0.1003 *	10.5 *	0.0996 *	10.5 *
	(0.5598)		(0.4336)		(3.5905)		(3.4857)	
LOG_ASST	0.0102	1.0	0.0081	0.8	-0.1327 **	-12.4 **	-0.1368 **	-12.8 **
	(0.2391)		(0.1474)		(7.4334)		(7.8554)	
OWNHOME	-0.4312 **	-35.0 **	-0.4257 **	-34.7 **	0.3087	36.2	0.3381	40.2
	(4.9942)		(4.7624)		(1.9476)		(2.2965)	
Log-likelihood	-215.666		-219.762		-303.228		-305.320	
-2Log-Likelihood	4,516.620		4,512.523		1,526.474		1,524.382	
-2Log-Likelihood (Slope = 0)	4,732.285		4,732.285		1,829.702		1,829.702	
Observation(total)	1,985		1,985		1,985		1,985	
Uncensored	318		391		126		126	
Censored	1,667		1,667		1,859		1,859	

Note:
(): Wald Chi-square.
Significance: * indicates 5% < p < 10%, and ** indicates p ≤ 5%.
a/ The % effect of a covariate = (exp(β)-1)*100%.

TABLE 3-8: HAZARD RATES AND SURVIVAL DISTRIBUTIONS FOR FOUR RISKS IN TWO PERIODS: 1982-1984 AND 1984-1989
[BASED ON THE RESULTS FROM WEIBULL ESTIMATES: MODEL II]

Lengths of stay in the community or in a nursing home (Months)	Mean respondent								Mean respondent							
	1982-84				1984-89				1982-84				1984-89			
	Hazard rate (Total a/)	Survival probability in the community			Hazard rate (Total a/)	Survival probability in the community			Hazard rate (Total a/)	Survival probability in the community			Hazard rate (Total a/)	Survival probability in the community		
		Nursing home entry risk S (c to n)	Mortality risk S (c to d)	Total risk in the community S c b/		Nursing home entry risk S (c to n)	Mortality risk S (c to d)	Total risk in the community S c b/		Nursing home discharge risk S (n to c)	Mortality risk S (n to d)	Total risk in a nusing home S n b/		Nursing home discharge risk S (n to c)	Mortality risk S (n to d)	Total risk in a nusing home S n b/
0	0.00000	1.00000	1.00000	1.00000	0.00000	1.00000	1.00000	1.00000	0.00000	1.00000	1.00000	1.00000	0.00000	1.00000	.	1.00000
2	0.00000	1.00000	0.99046	0.99046	0.00047	0.99943	0.99755	0.99698	0.04218	0.86754	0.95390	0.82755	0.00017	0.99975	.	0.99975
4	0.00000	1.00000	0.97920	0.97920	0.00073	0.99823	0.99649	0.99472	0.03182	0.80701	0.91541	0.73875	0.00022	0.99935	.	0.99935
6	0.00000	1.00000	0.96728	0.96727	0.00094	0.99655	0.99568	0.99224	0.02699	0.76127	0.88024	0.67010	0.00026	0.99886	.	0.99886
8	0.00003	0.99997	0.95496	0.95493	0.00113	0.99448	0.99499	0.98949	0.02401	0.72358	0.84748	0.61320	0.00029	0.99832	.	0.99832
10	0.00010	0.99986	0.94239	0.94226	0.00131	0.99205	0.99438	0.98647	0.02193	0.69115	0.81667	0.56444	0.00031	0.99772	.	0.99772
12	0.00033	0.99946	0.92965	0.92915	0.00147	0.98929	0.99382	0.98318	0.02036	0.66257	0.78753	0.52179	0.00033	0.99708	.	0.99708
14	0.00088	0.99832	0.91681	0.91527	0.00162	0.98624	0.99331	0.97964	0.01913	0.63694	0.75987	0.48399	0.00035	0.99640	.	0.99640
16	0.00206	0.99553	0.90390	0.89986	0.00177	0.98290	0.99284	0.97586	0.01812	0.61368	0.73353	0.45015	0.00037	0.99568	.	0.99568
18	0.00436	0.98940	0.89096	0.88152	0.00191	0.97929	0.99239	0.97184	0.01727	0.59235	0.70840	0.41963	0.00038	0.99494	.	0.99494
20	0.00851	0.97713	0.87802	0.85794	0.00204	0.97543	0.99197	0.96760	0.01655	0.57267	0.68439	0.39193	0.00040	0.99416	.	0.99416
22	0.01560	0.95443	0.86510	0.82567	0.00217	0.97134	0.99156	0.96314	0.01592	0.55438	0.66140	0.36667	0.00041	0.99335	.	0.99335
24	0.02713	0.91532	0.85221	0.78005	0.00229	0.96702	0.99118	0.95848	0.01536	0.53731	0.63938	0.34355	0.00043	0.99251	.	0.99251
26	.	.	.	.	0.00241	0.96248	0.99081	0.95363	.	.	.	.	0.00044	0.99165	.	0.99165
28	.	.	.	.	0.00253	0.95773	0.99045	0.94858	.	.	.	.	0.00045	0.99077	.	0.99077
30	.	.	.	.	0.00264	0.95279	0.99010	0.94336	.	.	.	.	0.00046	0.98987	.	0.98987
32	.	.	.	.	0.00276	0.94766	0.98977	0.93796	.	.	.	.	0.00047	0.98894	.	0.98894
34	.	.	.	.	0.00286	0.94235	0.98945	0.93240	.	.	.	.	0.00048	0.98799	.	0.98799
36	.	.	.	.	0.00297	0.93687	0.98913	0.92668	.	.	.	.	0.00049	0.98703	.	0.98703
38	.	.	.	.	0.00308	0.93122	0.98883	0.92081	.	.	.	.	0.00050	0.98604	.	0.98604
40	.	.	.	.	0.00318	0.92541	0.98853	0.91480	.	.	.	.	0.00051	0.98504	.	0.98504
42	.	.	.	.	0.00328	0.91946	0.98824	0.90864	.	.	.	.	0.00052	0.98402	.	0.98402
44	.	.	.	.	0.00338	0.91338	0.98795	0.90235	.	.	.	.	0.00053	0.98298	.	0.98298
46	.	.	.	.	0.00348	0.90712	0.98768	0.89594	.	.	.	.	0.00054	0.98193	.	0.98193
48	.	.	.	.	0.00357	0.90075	0.98740	0.88940	.	.	.	.	0.00055	0.98086	.	0.98086
50	.	.	.	.	0.00367	0.89425	0.98714	0.88275	.	.	.	.	0.00056	0.97977	.	0.97977
52	.	.	.	.	0.00376	0.88764	0.98688	0.87599	.	.	.	.	0.00056	0.97868	.	0.97868
54	.	.	.	.	0.00385	0.88091	0.98662	0.86912	.	.	.	.	0.00057	0.97756	.	0.97756
56	.	.	.	.	0.00394	0.87407	0.98637	0.86216	.	.	.	.	0.00058	0.97644	.	0.97644
58	.	.	.	.	0.00403	0.86713	0.98612	0.85510	.	.	.	.	0.00059	0.97530	.	0.97530
60	.	.	.	.	0.00412	0.86009	0.98588	0.84795	.	.	.	.	0.00059	0.97414	.	0.97414
62	.	.	.	.	0.00421	0.85296	0.98564	0.84071	.	.	.	.	0.00060	0.97298	.	0.97298
64	.	.	.	.	0.00429	0.84574	0.98540	0.83340	.	.	.	.	0.00061	0.97180	.	0.97180
66	.	.	.	.	0.00438	0.83844	0.98517	0.82601	.	.	.	.	0.00062	0.97061	.	0.97061
68	.	.	.	.	0.00446	0.83106	0.98494	0.81855	.	.	.	.	0.00062	0.96941	.	0.96941
70	.	.	.	.	0.00455	0.82361	0.98472	0.81102	.	.	.	.	0.00063	0.96820	.	0.96820
72	.	.	.	.	0.00463	0.81609	0.98449	0.80343	.	.	.	.	0.00064	0.96697	.	0.96697
74	.	.	.	.	0.00471	0.80850	0.98427	0.79579	.	.	.	.	0.00064	0.96574	.	0.96574
76	.	.	.	.	0.00479	0.80085	0.98406	0.78809	.	.	.	.	0.00065	0.96449	.	0.96449
78	.	.	.	.	0.00487	0.79315	0.98384	0.78034	.	.	.	.	0.00065	0.96324	.	0.96324
80	.	.	.	.	0.00495	0.78540	0.98363	0.77254	.	.	.	.	0.00066	0.96197	.	0.96197
82	.	.	.	.	0.00503	0.77760	0.98343	0.76471	.	.	.	.	0.00067	0.96070	.	0.96070

Notes: This table is calculated using the regression results in Appendix Tables 1-1-1, 1-1-2, 1-2-1, and 1-2-2

a/ Each total hazard rate in the community and in a nursing home are obtained by calculating (i) the sum of the hazard rate of a nursing home entry and that of death, and (ii) the sum of the hazard rate of a nursing home discharge and that of death

b/ Each total survival probability in the community and in a nusing home are obtained by multiplying (i) the survival probability of a nursing home entry by that of death, (ii) and the survival probability of a nursing home discharge by that of death.

TABLE 3-9: DISTRIBUTIONS OF SURVIVAL PROBABILITIES FROM THE COMMUNITY TO A NURSING HOME FOR THE ELDERLY LIVING IN THE COMMUNITY AT THE INTERVIEWS IN 1982 AND 1984 NLTCS: EFFECTS OF STATE MEDICAID POLICIES AND LIMITATIONS IN ADLs AND IADLs [BASED ON THE RESULTS FROM WEIBULL ESTIMATES: MODEL II]

Months	1982-1984 Survival probability from the community to a nursing home									1984-1989 Survival probability from the community to a nursing home								
	Mean	(M_NEEDY=1)	(M_NEEDY=0)	(H_WAIVER=1) a/	(H_WAIVER=0) a/	(ADL1=1) a/	(ADL3=1)	(ADL5=1)	(IADL=1)	Mean	(M_NEEDY=1)	(M_NEEDY=0)	(H_WAIVER=1) a/	(H_WAIVER=0) a/	(ADL1=1) a/	(ADL3=1) a/	(ADL5=1)	(IADL=1) a/
0	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
2	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	0.99943	0.99937	0.99951	0.99943	0.99942	0.99939	0.99922	0.99908	0.99942
4	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	0.99823	0.99803	0.99848	0.99823	0.99819	0.99810	0.99756	0.99714	0.99819
6	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	0.99999	0.99999	1.00000	0.99655	0.99617	0.99704	0.99657	0.99649	0.99631	0.99526	0.99444	0.99649
8	0.99997	0.99997	0.99998	0.99997	0.99997	0.99997	0.99995	0.99995	0.99997	0.99448	0.99386	0.99526	0.99451	0.99438	0.99410	0.99242	0.99111	0.99438
10	0.99986	0.99985	0.99988	0.99987	0.99984	0.99985	0.99977	0.99972	0.99984	0.99205	0.99116	0.99318	0.99209	0.99191	0.99150	0.98909	0.98720	0.99191
12	0.99946	0.99941	0.99953	0.99948	0.99937	0.99944	0.99911	0.99893	0.99940	0.98929	0.98810	0.99081	0.98935	0.98910	0.98855	0.98531	0.98276	0.98910
14	0.99832	0.99816	0.99855	0.99840	0.99805	0.99826	0.99724	0.99669	0.99814	0.98624	0.98470	0.98818	0.98631	0.98599	0.98528	0.98113	0.97788	0.98599
16	0.99553	0.99510	0.99613	0.99573	0.99479	0.99535	0.99264	0.99118	0.99503	0.98290	0.98099	0.98531	0.98299	0.98259	0.98172	0.97656	0.97254	0.98259
18	0.98940	0.98837	0.99081	0.98986	0.98765	0.98897	0.98257	0.97914	0.98822	0.97929	0.97699	0.98221	0.97940	0.97893	0.97786	0.97164	0.96679	0.97892
20	0.97713	0.97493	0.98015	0.97812	0.97338	0.97621	0.96255	0.95525	0.97481	0.97543	0.97271	0.97889	0.97557	0.97500	0.97374	0.96638	0.96065	0.97499
22	0.95443	0.95009	0.96037	0.95638	0.94704	0.95261	0.92592	0.91183	0.94945	0.97134	0.96817	0.97536	0.97149	0.97083	0.96937	0.96081	0.95415	0.97083
24	0.91532	0.90744	0.92617	0.91887	0.90193	0.91202	0.86416	0.83937	0.90829	0.96702	0.96337	0.97164	0.96719	0.96644	0.96476	0.95493	0.94731	0.96643
26	.	.	.	.	.	.	.	.	.	0.96248	0.95835	0.96772	0.96268	0.96182	0.95991	0.94877	0.94014	0.96181
28	.	.	.	.	.	.	.	.	.	0.95773	0.95309	0.96363	0.95796	0.95699	0.95485	0.94235	0.93268	0.95698
30	.	.	.	.	.	.	.	.	.	0.95279	0.94762	0.95936	0.95304	0.95197	0.94958	0.93567	0.92492	0.95196
32	.	.	.	.	.	.	.	.	.	0.94766	0.94195	0.95493	0.94794	0.94675	0.94411	0.92875	0.91690	0.94674
34	.	.	.	.	.	.	.	.	.	0.94235	0.93608	0.95034	0.94265	0.94135	0.93845	0.92160	0.90862	0.94134
36	.	.	.	.	.	.	.	.	.	0.93687	0.93002	0.94559	0.93720	0.93578	0.93261	0.91424	0.90010	0.93576
38	.	.	.	.	.	.	.	.	.	0.93122	0.92379	0.94070	0.93158	0.93003	0.92660	0.90667	0.89136	0.93002
40	.	.	.	.	.	.	.	.	.	0.92541	0.91738	0.93567	0.92580	0.92413	0.92042	0.89891	0.88241	0.92412
42	.	.	.	.	.	.	.	.	.	0.91946	0.91082	0.93050	0.91988	0.91808	0.91409	0.89096	0.87326	0.91806
44	.	.	.	.	.	.	.	.	.	0.91336	0.90410	0.92520	0.91381	0.91188	0.90760	0.88285	0.86393	0.91186
46	.	.	.	.	.	.	.	.	.	0.90712	0.89723	0.91978	0.90760	0.90554	0.90097	0.87457	0.85443	0.90552
48	.	.	.	.	.	.	.	.	.	0.90075	0.89022	0.91424	0.90126	0.89907	0.89421	0.86613	0.84477	0.89905
50	.	.	.	.	.	.	.	.	.	0.89425	0.88308	0.90858	0.89480	0.89247	0.88731	0.85756	0.83496	0.89245
52	.	.	.	.	.	.	.	.	.	0.88764	0.87582	0.90281	0.88822	0.88575	0.88029	0.84885	0.82502	0.88573
54	.	.	.	.	.	.	.	.	.	0.88091	0.86844	0.89694	0.88152	0.87892	0.87315	0.84001	0.81495	0.87889
56	.	.	.	.	.	.	.	.	.	0.87407	0.86094	0.89096	0.87472	0.87197	0.86591	0.83106	0.80476	0.87195
58	.	.	.	.	.	.	.	.	.	0.86713	0.85334	0.88489	0.86781	0.86493	0.85855	0.82200	0.79447	0.86490
60	.	.	.	.	.	.	.	.	.	0.86009	0.84564	0.87872	0.86080	0.85778	0.85110	0.81284	0.78409	0.85775
62	.	.	.	.	.	.	.	.	.	0.85296	0.83784	0.87247	0.85370	0.85054	0.84355	0.80359	0.77363	0.85051
64	.	.	.	.	.	.	.	.	.	0.84574	0.82996	0.86613	0.84652	0.84322	0.83592	0.79426	0.76309	0.84318
66	.	.	.	.	.	.	.	.	.	0.83844	0.82199	0.85971	0.83925	0.83581	0.82820	0.78484	0.75248	0.83577
68	.	.	.	.	.	.	.	.	.	0.83106	0.81394	0.85322	0.83190	0.82832	0.82040	0.77536	0.74182	0.82828
70	.	.	.	.	.	.	.	.	.	0.82361	0.80583	0.84665	0.82448	0.82076	0.81253	0.76582	0.73112	0.82072
72	.	.	.	.	.	.	.	.	.	0.81609	0.79764	0.84001	0.81699	0.81313	0.80460	0.75622	0.72037	0.81309
74	.	.	.	.	.	.	.	.	.	0.80850	0.78940	0.83331	0.80944	0.80544	0.79660	0.74657	0.70959	0.80539
76	.	.	.	.	.	.	.	.	.	0.80085	0.78110	0.82654	0.80182	0.79768	0.78854	0.73688	0.69879	0.79764
78	.	.	.	.	.	.	.	.	.	0.79315	0.77274	0.81972	0.79415	0.78987	0.78043	0.72715	0.68798	0.78983
80	.	.	.	.	.	.	.	.	.	0.78540	0.76435	0.81284	0.78643	0.78202	0.77227	0.71739	0.67716	0.78197
82	.	.	.	.	.	.	.	.	.	0.77760	0.75590	0.80591	0.77866	0.77411	0.76407	0.70761	0.66634	0.77406

Notes This table is calculated using the regression results in Appendix Tables 1-1-1, 1-1-2, 1-2-1, and 1-2-2
a/ This result is based on an insignificant result

TABLE 3-10: HAZARD RATES AND SURVIVAL DISTRIBUTIONS FOR NURSING HOME ENTRY AND MORTALITY RISKS IN THE COMMUNITY IN 1982-1989, USING EXPLANATORY VARIABLES MEASURED AT THE INTERVIEW IN THE 1982 NLTCS [BASED ON THE RESULTS FROM WEIBULL ESTIMATES: MODEL II]

Lengths of stay in the community or in a nursing home (Months)	Mean respondent 1982-89			
	Hazard rate (Total a/)	Survival probability in the community		
		Nursing home entry risk S (c to n)	Mortality risk S (c to d)	Total risk in the community S c b/
0	0.00000	1.00000	1.00000	1.00000
2	0.01088	0.99777	0.97362	0.97145
4	0.00963	0.99410	0.95760	0.95195
6	0.00913	0.98958	0.94416	0.93432
8	0.00888	0.98442	0.93220	0.91768
10	0.00874	0.97874	0.92126	0.90167
12	0.00866	0.97260	0.91108	0.88612
14	0.00863	0.96607	0.90152	0.87093
16	0.00862	0.95920	0.89246	0.85604
18	0.00862	0.95202	0.88382	0.84141
20	0.00864	0.94457	0.87554	0.82701
22	0.00867	0.93686	0.86759	0.81282
24	0.00870	0.92893	0.85993	0.79882
26	0.00874	0.92080	0.85252	0.78500
28	0.00878	0.91248	0.84535	0.77136
30	0.00883	0.90400	0.83839	0.75790
32	0.00888	0.89536	0.83162	0.74460
34	0.00892	0.88659	0.82503	0.73146
36	0.00897	0.87769	0.81861	0.71848
38	0.00902	0.86868	0.81235	0.70567
40	0.00908	0.85957	0.80623	0.69301
42	0.00913	0.85037	0.80025	0.68051
44	0.00918	0.84109	0.79440	0.66816
46	0.00923	0.83174	0.78867	0.65597
48	0.00929	0.82233	0.78306	0.64394
50	0.00934	0.81287	0.77756	0.63205
52	0.00939	0.80337	0.77216	0.62033
54	0.00944	0.79383	0.76686	0.60875
56	0.00950	0.78426	0.76165	0.59733
58	0.00955	0.77466	0.75654	0.58606
60	0.00960	0.76505	0.75151	0.57495
62	0.00965	0.75543	0.74657	0.56399
64	0.00970	0.74581	0.74171	0.55317
66	0.00975	0.73619	0.73692	0.54252
68	0.00981	0.72658	0.73221	0.53201
70	0.00986	0.71697	0.72757	0.52165
72	0.00991	0.70739	0.72300	0.51144
74	0.00996	0.69782	0.71850	0.50138
76	0.01001	0.68828	0.71406	0.49147
78	0.01006	0.67877	0.70968	0.48171
80	0.01010	0.66929	0.70537	0.47210
82	0.01015	0.65985	0.70111	0.46263
84	0.01020	0.65045	0.69691	0.45331
86	0.01025	0.64110	0.69276	0.44413
88	0.01030	0.63179	0.68867	0.43510
90	0.01035	0.62254	0.68463	0.42621
92	0.01039	0.61333	0.68064	0.41746
94	0.01044	0.60418	0.67670	0.40885
96	0.01049	0.59509	0.67281	0.40038

Notes: This table is calculated using the regression results in Appendix Table 1-3.
a/ Each total hazard rate in the community and in a nursing home are obtained by calculating (i) the sum of the hazard rate of a nursing home entry and that of death; and (ii) the sum of the hazard rate of a nursing home discharge and that of death.
b/ Each total survival probability in the community and in a nusing home are obtained by multiplying (i) the survival probability of a nursing home entry by that of death; and (ii) the survival probability of a nursing home discharge by that of death.

TABLE 3-11: DISTRIBUTIONS OF SURVIVAL PROBABILITIES FROM THE COMMUNITY TO A NURSING HOME IN 1982-1989, USING EXPLANATORY VARIABLES MEASURED AT THE INTERVIEW IN THE 1982 NLTCS: EFFECTS OF STATE MEDICAID POLICIES AND LIMITATIONS IN ADLs AND IADLs [BASED ON THE RESULTS FROM WEIBULL ESTIMATES: MODEL II]

Months	1982-1989 Survival probability from the community to a nursing home										
	Mean	(M_NEEDY=1)	(M_NEEDY=0)	(H_WAIVER=1) a/	(H_WAIVER=0) a/	(PAS=1)	(PAS=0)	(ADL1=1) a/	(ADL3=1) a/	(ADL5=1)	(IADL=1)
0	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
2	0.99777	0.99754	0.99809	0.99783	0.99757	0.99760	0.99799	0.99774	0.99716	0.99627	0.99758
4	0.99410	0.99348	0.99494	0.99425	0.99357	0.99365	0.99468	0.99402	0.99249	0.99013	0.99360
6	0.98958	0.98848	0.99107	0.98984	0.98865	0.98879	0.99060	0.98945	0.98675	0.98260	0.98871
8	0.98442	0.98278	0.98664	0.98481	0.98303	0.98324	0.98594	0.98422	0.98020	0.97402	0.98311
10	0.97874	0.97651	0.98175	0.97926	0.97684	0.97713	0.98080	0.97845	0.97299	0.96460	0.97695
12	0.97260	0.96974	0.97648	0.97327	0.97016	0.97053	0.97525	0.97224	0.96523	0.95448	0.97031
14	0.96607	0.96254	0.97086	0.96690	0.96306	0.96352	0.96935	0.96562	0.95698	0.94377	0.96325
16	0.95920	0.95497	0.96494	0.96019	0.95559	0.95614	0.96313	0.95866	0.94832	0.93254	0.95582
18	0.95202	0.94707	0.95875	0.95318	0.94780	0.94844	0.95662	0.95139	0.93929	0.92086	0.94806
20	0.94457	0.93886	0.95231	0.94590	0.93971	0.94045	0.94986	0.94384	0.92993	0.90880	0.94001
22	0.93686	0.93040	0.94565	0.93838	0.93135	0.93219	0.94287	0.93604	0.92028	0.89641	0.93169
24	0.92893	0.92169	0.93879	0.93063	0.92276	0.92370	0.93567	0.92801	0.91036	0.88372	0.92314
26	0.92080	0.91277	0.93174	0.92269	0.91395	0.91500	0.92828	0.91978	0.90022	0.87079	0.91437
28	0.91248	0.90365	0.92452	0.91456	0.90495	0.90610	0.92071	0.91136	0.88988	0.85764	0.90542
30	0.90400	0.89436	0.91715	0.90626	0.89578	0.89703	0.91299	0.90277	0.87935	0.84431	0.89629
32	0.89536	0.88492	0.90964	0.89782	0.88645	0.88781	0.90512	0.89403	0.86866	0.83082	0.88700
34	0.88659	0.87533	0.90200	0.88924	0.87698	0.87845	0.89711	0.88515	0.85783	0.81722	0.87758
36	0.87769	0.86562	0.89423	0.88053	0.86739	0.86896	0.88899	0.87615	0.84688	0.80351	0.86802
38	0.86868	0.85579	0.88636	0.87172	0.85769	0.85936	0.88075	0.86704	0.83582	0.78973	0.85836
40	0.85957	0.84587	0.87839	0.86280	0.84788	0.84966	0.87242	0.85782	0.82467	0.77589	0.84860
42	0.85037	0.83586	0.87033	0.85380	0.83799	0.83987	0.86399	0.84852	0.81344	0.76202	0.83875
44	0.84109	0.82578	0.86219	0.84471	0.82803	0.83001	0.85549	0.83914	0.80215	0.74813	0.82883
46	0.83174	0.81564	0.85397	0.83555	0.81800	0.82008	0.84691	0.82969	0.79082	0.73424	0.81884
48	0.82233	0.80544	0.84569	0.82634	0.80791	0.81010	0.83826	0.82018	0.77944	0.72036	0.80880
50	0.81287	0.79519	0.83734	0.81706	0.79778	0.80007	0.82956	0.81062	0.76803	0.70652	0.79871
52	0.80337	0.78491	0.82895	0.80775	0.78762	0.79000	0.82080	0.80101	0.75661	0.69272	0.78858
54	0.79383	0.77461	0.82051	0.79839	0.77742	0.77991	0.81201	0.79137	0.74518	0.67898	0.77843
56	0.78426	0.76429	0.81202	0.78900	0.76721	0.76979	0.80317	0.78170	0.73376	0.66531	0.76825
58	0.77466	0.75395	0.80350	0.77959	0.75698	0.75966	0.79430	0.77201	0.72234	0.65172	0.75806
60	0.76505	0.74361	0.79496	0.77016	0.74674	0.74952	0.78541	0.76231	0.71095	0.63823	0.74786
62	0.75543	0.73328	0.78638	0.76071	0.73651	0.73937	0.77650	0.75260	0.69958	0.62483	0.73767
64	0.74581	0.72295	0.77779	0.75126	0.72629	0.72924	0.76757	0.74288	0.68825	0.61154	0.72748
66	0.73619	0.71264	0.76919	0.74181	0.71608	0.71912	0.75864	0.73317	0.67696	0.59837	0.71730
68	0.72658	0.70236	0.76057	0.73236	0.70588	0.70901	0.74969	0.72347	0.66571	0.58532	0.70715
70	0.71697	0.69209	0.75195	0.72292	0.69572	0.69893	0.74075	0.71378	0.65453	0.57241	0.69701
72	0.70739	0.68187	0.74333	0.71349	0.68558	0.68887	0.73181	0.70411	0.64340	0.55963	0.68691
74	0.69782	0.67167	0.73471	0.70408	0.67548	0.67885	0.72288	0.69446	0.63234	0.54700	0.67684
76	0.68828	0.66152	0.72609	0.69469	0.66541	0.66886	0.71396	0.68484	0.62135	0.53452	0.66681
78	0.67877	0.65142	0.71749	0.68533	0.65539	0.65892	0.70506	0.67525	0.61043	0.52219	0.65682
80	0.66929	0.64137	0.70889	0.67600	0.64542	0.64902	0.69617	0.66570	0.59959	0.51003	0.64687
82	0.65985	0.63137	0.70032	0.66670	0.63550	0.63917	0.68731	0.65618	0.58884	0.49802	0.63698
84	0.65045	0.62143	0.69176	0.65744	0.62564	0.62937	0.67848	0.64671	0.57818	0.48618	0.62715
86	0.64110	0.61155	0.68323	0.64821	0.61583	0.61963	0.66967	0.63729	0.56761	0.47452	0.61737
88	0.63179	0.60174	0.67472	0.63904	0.60609	0.60995	0.66089	0.62791	0.55713	0.46302	0.60765
90	0.62254	0.59199	0.66624	0.62990	0.59641	0.60033	0.65215	0.61859	0.54675	0.45170	0.59800
92	0.61333	0.58232	0.65779	0.62082	0.58680	0.59078	0.64345	0.60932	0.53648	0.44056	0.58841
94	0.60418	0.57272	0.64938	0.61179	0.57727	0.58130	0.63479	0.60011	0.52630	0.42960	0.57890
96	0.59509	0.56320	0.64100	0.60281	0.56780	0.57189	0.62617	0.59096	0.51624	0.41882	0.56945

Notes This table is calculated using the regression results in Appendix Table 1-3
a/ This result is based on an insignificant result

APPENDIX TABLE 1-1-1: PARAMETRIC HAZARDS ESTIMATES FOR TRANSITION PROBABILITIES OF ELDERLY PERSONS FROM THE COMMUNITY TO A NURSING HOME IN TWO PERIODS: 1982-1984 AND 1984-1989 (WEIBULL DISTRIBUTION) [ESTIMATED BY LIFEREG IN SAS]

	1982-1984				1984-1989			
	MODEL I		MODEL II		MODEL I		MODEL II	
	NH entry risk (C→N)		NH entry risk (C→N)		NH entry risk (C→N)		NH entry risk (C→N)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
CONSTANT	-28.8140 **	1635.5200	-28.8598 **	1626.7080	-12.3157 **	203.1842	-12.5406 **	200.8355
MEDICAID	1.6815	0.8021	-	-	-3.4241	1.7467	-	-
M_NEEDY	-	-	0.2361 **	5.8905	-	-	0.2599 **	3.8967
H_WAIVER	-	-	-0.1988	2.4254	-	-	-0.0232	0.0183
PAS1	-	-	0.0987	0.8440	-	-	0.1421	1.0394
PAS2	-	-	-0.1662	1.0474	-	-	-0.0165	0.0060
MEDLGRAT	-0.3323	0.9480	-0.1591	0.4844	0.0436	0.0093	-0.6039 *	3.3892
MEDLGBED	-0.1367	0.1827	0.1476	0.6043	0.7822 *	3.0625	0.4504 *	2.7932
LG_PRICE	-0.1509 **	6.0303	-0.1449 **	5.7905	-0.0646	2.6900	-0.0644	2.6866
WHITE	0.9195 **	23.1364	0.8500 **	19.6207	1.0106 **	18.3155	0.9706 **	16.7890
MALE	0.0328	0.0928	0.0392	0.1322	0.0774	0.2678	0.0784	0.2751
MARRIED	-0.4248 **	12.7099	-0.4376 **	13.4454	-0.2996 *	2.8212	-0.2997 *	2.7782
AGE	0.0315 **	24.7593	0.0312 **	24.2366	0.0506 **	31.1674	0.0507 **	30.9727
HHOLD	-0.1271 **	9.3865	-0.1216 **	8.7309	-0.1494 **	7.3637	-0.1468 **	7.1290
NCHILD	-0.1036 **	19.8324	-0.0994 **	18.1823	-0.0716 **	5.7716	-0.0652 **	4.7101
ADL1	0.0591	0.2501	0.0523	0.1957	0.0783	0.2661	0.0857	0.3171
ADL2	0.3758 **	7.8692	0.3658 **	7.4505	0.3646 **	4.2869	0.3707 **	4.4271
ADL3	0.5330 **	5.2564	0.5168 **	4.9353	0.2831	0.5892	0.3259	0.7752
ADL4	0.4955 **	9.3376	0.5095 **	9.8715	0.3726	2.2667	0.4297 *	2.9799
ADL5	0.7403 **	25.7956	0.7601 **	27.1663	0.5224 **	5.5174	0.5081 **	5.1638
IADLS	1.0351 **	15.5495	1.0209 **	15.1169	0.1213	0.4316	0.0992	0.2874
SENILE	0.4271 **	11.0282	0.4549 **	12.4145	0.9453 **	20.1979	0.9866 **	21.4683
CANCER	0.2534	1.9757	0.2825	2.4417	-0.4084	1.2726	-0.3840	1.1233
STROKE	0.3723 **	6.6363	0.3526 **	5.9188	0.6217 **	7.1667	0.6212 **	7.1627

APPENDIX TABLE 1-1-1- Continued

	1982-1984				1984-1989			
	MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)		MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
LUNG	-0.2790 **	6.2403	-0.2728 **	5.9714	-0.5794 **	11.1073	-0.5673 **	10.6422
HIPBREAK	0.4179 **	4.4714	0.4248 **	4.5902	0.2760	0.2877	0.3201	0.3868
NEUROL	0.3807 **	6.0663	0.4149 **	7.1477	-0.1652	0.2513	-0.1170	0.1253
PRIHOSP	0.2653 **	8.2975	0.2783 **	9.1054	-0.1265	0.8081	-0.1238	0.7749
URBAN	-0.0721	0.6693	-0.1063	1.4182	-0.1113	0.8832	-0.1392	1.3511
LOG_FINC	0.0110	0.2706	0.0141	0.4479	-0.0205	0.5661	-0.0181	0.4373
LOG_ASST	0.0234	2.6588	0.0231	2.5750	0.0093	0.1976	0.0071	0.1127
OWNHOME	-0.1377	2.1212	-0.1193	1.5695	-0.4275 **	4.8664	-0.4226 **	4.6533
σ	0.1341		0.1359		0.6097		0.6098	
Log-likelihood	-876.805		-872.754		-939.061		-936.926	

Note:

Significance: * indicates 5% < p < 10%, and ** indicates p ≤ 5%.

APPENDIX TABLE 1-1-2: PARAMETRIC HAZARDS ESTIMATES FOR TRANSITION PROBABILITIES OF ELDERLY PERSONS FROM THE COMMUNITY TO DEATH IN TWO PERIODS: 1982-1984 AND 1984-1989 (WEIBULL DISTRIBUTION) [ESTIMATED BY LIFEREG IN SAS]

	1982-1984				1984-1989			
	MODEL I		MODEL II		MODEL I		MODEL II	
	Mortality in the community (C→D)		Mortality in the community (C→D)		Mortality in the community (C→D)		Mortality in the community (C→D)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
CONSTANT	-10.1889 **	228.3182	-10.2158 **	236.0674	-13.6087 **	78.4075	-13.6911 **	77.4267
MEDICAID	-0.5327	0.0928	-	-	-3.3292	0.6795	-	-
M_NEEDY	-	-	0.0712	0.8411	-	-	0.0288	0.0191
H_WAIVER	-	-	0.0605	0.3316	-	-	-0.2555	0.8825
PAS1	-	-	0.1050	1.4801	-	-	0.3772	2.6704
PAS2	-	-	-0.2140	2.3703	-	-	0.0962	0.0963
MEDLGRAT	0.3946	1.9187	0.2418	1.6515	0.4051	0.3509	0.0041	0.0001
MEDLGBED	-0.2357	0.5942	-0.2420	2.2676	0.5616	0.5690	0.0458	0.0118
LG_PRICE	0.0614	0.4954	0.0385	0.2107	0.0767	2.0823	0.0738	1.8823
WHITE	-0.2419 **	5.4841	-0.2710 **	6.6523	1.1717 **	8.0911	1.1229 **	7.3298
MALE	0.4998 **	36.9000	0.5037 **	37.3831	0.6177 **	8.2472	0.6066 **	7.8141
MARRIED	-0.0698	0.6006	-0.0732	0.6564	-2.6242 **	50.4421	-2.6497 **	51.0500
AGE	0.0426 **	67.6706	0.0427 **	68.0725	0.0755 **	29.2989	0.0757 **	28.8929
HHOLD	0.0946 **	12.5503	0.0958 **	12.8304	-0.2014 **	4.5072	-0.1997 **	4.3197
NCHILD	-0.0567 **	10.8314	-0.0543 **	9.8874	-0.0086	0.0325	-0.0000	0.0000
ADL1	0.2299 **	5.5992	0.2259 **	5.3945	-1.6087 **	18.8983	-1.6042 **	18.8546
ADL2	0.2768 **	5.1380	0.2675 **	4.7829	-1.2665 **	9.7171	-1.2749 **	9.8537
ADL3	0.6399 **	12.8043	0.6369 **	12.6712	-22.6048	0.0000	-22.2663	0.0000
ADL4	0.4080 **	8.7442	0.4157 **	9.0654	-0.7905 *	3.7949	-0.8271 **	4.0177
ADL5	0.7066 **	38.0791	0.7164 **	38.9618	-1.3626 **	6.4686	-1.3793 **	6.5905
IADLS	0.5355 **	9.5584	0.5303 **	9.3678	1.6006 **	11.0996	1.6002 **	11.0884
SENILE	0.2451 **	5.4283	0.2538 **	5.8089	0.3462	1.0462	0.3890	1.3098
CANCER	1.0336 **	92.7895	1.0216 **	90.3866	0.4414	1.9519	0.4720	2.2260
STROKE	0.2392 **	4.2474	0.2343 **	4.0657	0.9298 **	11.5308	0.9219 **	11.2943

APPENDIX TABLE 1-1-2- Continued

	1982-1984				1984-1989			
	MODEL I Mortality in the community (C→D)		MODEL II Mortality in the community (C→D)		MODEL I Mortality in the community (C→D)		MODEL II Mortality in the community (C→D)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
LUNG	0.1787 **	4.9530	0.1838 **	5.2227	0.3034	1.9582	0.2957	1.8758
HIPBREAK	-0.4668 *	3.4550	-0.4545 *	3.2787	-0.1146	0.0240	-0.0225	0.0009
NEUROL	-0.0452	0.0814	-0.0275	0.0300	0.6481	2.5478	0.6557	2.5097
PRIHOSP	0.4571 **	36.6600	0.4603 **	36.9447	0.8672 **	18.7128	0.8651 **	18.5495
URBAN	0.0788	1.1700	0.0666	0.8168	0.1277	0.4236	0.1377	0.4812
LOG_FINC	0.0193	1.3043	0.0194	1.3089	0.0687	1.7166	0.0745	1.9804
LOG_ASST	-0.0094	0.5759	-0.0085	0.4673	-0.1209 **	5.8443	-0.1229 **	6.0140
OWNHOME	0.1788 **	5.1866	0.1998 **	6.3657	1.7410 **	49.7834	1.7719 **	50.8587
σ	0.8837		0.8830		1.9420		1.9372	
Log-likelihood	-2,698.613		-2,695.229		-551.562		-550.236	

Note:

Significance: * indicates 5% < p < 10%, and ** indicates p ≤ 5%.

APPENDIX TABLE 1-2-1: PARAMETRIC HAZARDS ESTIMATES FOR TRANSITION PROBABILITIES OF ELDERLY PERSONS FROM A NURSING HOME TO THE COMMUNITY IN TWO PERIODS: 1982-1984 AND 1984-1989 (WEIBULL DISTRIBUTION) [ESTIMATED BY LIFEREG IN SAS]

	1982-1984				1984-1989			
	MODEL I NH discharge risk (N→C)		MODEL II NH discharge risk (N→C)		MODEL I NH discharge risk (N→C)		MODEL II NH discharge risk (N→C)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
CONSTANT	0.3343	0.0415	1.0703	0.4305	-17.9497	0.0000	-17.2578	0.0000
MEDICAID	4.9455	1.3510	-	-	14.2636	1.3731	-	-
M_NEEDY	-	-	0.1988	0.8343	-	-	0.1636	0.1656
H_WAIVER	-	-	-0.3880	1.7792	-	-	0.0530	0.0099
PAS1	-	-	-0.0918	0.1523	-	-	-0.3532	0.6231
PAS2	-	-	0.4589	1.8396	-	-	-0.1088	0.0414
MEDLGRAT	-0.8507	1.0582	0.0426	0.0074	-4.1209 *	2.7157	-2.1124	2.2492
MEDLGBED	-0.5933	0.7815	-0.0774	0.0352	-0.5662	0.1048	1.4105	1.5629
LG_PRICE	0.0526	0.0919	0.0355	0.0408	0.1278	0.9524	0.1055	0.7963
WHITE	-0.4050	1.1297	-0.5566	2.1889	25.8709	0.0000	25.6974	0.0000
MALE	-0.0816	0.1422	-0.0526	0.0593	-0.5957	2.0857	-0.5969	1.9645
MARRIED	0.1748	0.5075	0.1511	0.3767	-0.1262	0.0948	-0.0081	0.0004
AGE	-0.0242 *	2.9840	-0.0272 *	3.8219	-0.1652 **	25.4931	-0.1691 **	25.9105
HHOLD	-0.0049	0.0035	-0.0012	0.0002	0.0469	0.1243	0.0681	0.2437
NCHILD	0.0746	2.5289	0.0700	2.2377	-0.0219	0.0395	-0.0371	0.1105
ADL1	-0.1692	0.4515	-0.2671	1.0964	-0.9834 **	4.4225	-0.9978 **	4.0715
ADL2	0.2012	0.4903	0.1587	0.3012	-0.0854	0.0206	-0.1009	0.0268
ADL3	0.0225	0.0025	0.0464	0.0104	-24.8258	0.0000	-24.3730	0.0000
ADL4	-0.1424	0.1580	-0.1329	0.1398	-0.9332	0.5743	-1.0269	0.7306
ADL5	0.2684	0.8696	0.2665	0.8575	-1.2729 **	4.8530	-1.1907 **	4.3476
IADLS	-0.5160	1.4835	-0.4962	1.3357	-0.2605	0.3635	-0.1881	0.1753
SENILE	-1.0175 **	12.0126	-1.0867 **	13.3029	-2.1411 *	3.2510	-2.1232 *	3.3271
CANCER	-0.2069	0.2950	-0.1882	0.2367	-0.4327	0.1337	-0.2914	0.0533
STROKE	0.3879	1.9485	0.4146	2.1985	-1.4733	1.8785	-1.5003	1.9482

APPENDIX TABLE 1-2-1- Continued

	1982-1984				1984-1989			
	MODEL I		MODEL II		MODEL I		MODEL II	
	NH discharge risk (N→C)		NH discharge risk (N→C)		NH discharge risk (N→C)		NH discharge risk (N→C)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
LUNG	0.4946 **	4.6331	0.4551 **	3.9175	0.6808	2.3930	0.7160	2.3710
HIPBREAK	0.5027	1.9131	0.5687	2.4619	-25.4592	4.2860E-09	-24.5994	7.7930E-09
NEUROL	-0.4432	1.7338	-0.4950	2.1717	-0.6165	0.2418	-0.5044	0.1746
PRIHOSP	-0.2515	1.5750	-0.3119	2.4696	0.0518	0.0177	-0.0661	0.0271
URBAN	0.4761 **	6.4141	0.5361 **	7.7375	-0.1136	0.1188	-0.1652	0.2508
LOG_FINC	-0.0562	1.8136	-0.0620	2.2252	-0.0052	0.0043	-0.0221	0.0724
LOG_ASST	0.0522 *	3.0117	0.0600 **	3.8656	-0.0756	1.7936	-0.0898	2.3634
OWNHOME	-0.0702	0.1111	-0.1417	0.4356	0.0679	0.0179	0.0349	0.0046
σ	1.6967		1.6845		0.7378		0.7338	
Log-likelihood	-466.841		-465.217		-116.362		-116.544	

Note:

Significance: * indicates 5% < p < 10%, and ** indicates p ≤ 5%.

APPENDIX TABLE 1-2-2: PARAMETRIC HAZARDS ESTIMATES FOR TRANSITION PROBABILITIES OF ELDERLY PERSONS FROM A NURSING HOME TO DEATH IN TWO PERIODS: 1982-1984 AND 1984-1989 (WEIBULL DISTRIBUTION) [ESTIMATED BY LIFEREG IN SAS]

	1982-1984				1984-1989			
	MODEL I		MODEL II		MODEL I		MODEL II	
	Mortality in a nursing home (N→D)		Mortality in a nursing home (N→D)		Mortality in a nursing home (N→D)		Mortality in a nursing home (N→D)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
CONSTANT	-7.8836 **	12.0027	-7.0277 **	9.1112	-	-	-	-
MEDICAID	6.0154	1.5541	-	-	-	-	-	-
M_NEEDY	-	-	0.5177 *	2.8886	-	-	-	-
H_WAIVER	-	-	0.0307	0.0059	-	-	-	-
PAS1	-	-	-0.2737	0.7086	-	-	-	-
PAS2	-	-	-0.0342	0.0051	-	-	-	-
MEDLGRAT	-0.4784	0.2432	0.3636	0.3335	-	-	-	-
MEDLGBED	-1.0341	1.7706	-0.2062	0.1563	-	-	-	-
LG_PRICE	-0.0029	0.0004	-0.0529	0.1142	-	-	-	-
WHITE	0.2317	0.2132	0.0318	0.0039	-	-	-	-
MALE	0.0991	0.1105	0.1041	0.1205	-	-	-	-
MARRIED	0.4202	1.5914	0.4350	1.6535	-	-	-	-
AGE	0.0372 *	3.8087	0.0328 *	2.8461	-	-	-	-
HHOLD	0.0766	0.4725	0.0921	0.6695	-	-	-	-
NCHILD	-0.1122	2.0831	-0.0970	1.5671	-	-	-	-
ADL1	0.3995	1.5383	0.2753	0.7202	-	-	-	-
ADL2	-0.0321	0.0068	-0.2032	0.2644	-	-	-	-
ADL3	0.0335	0.0032	0.1256	0.0434	-	-	-	-
ADL4	-0.3545	0.4607	-0.3684	0.5065	-	-	-	-
ADL5	-0.5347	1.6868	-0.5363	1.6816	-	-	-	-
IADLS	0.4609	0.1973	0.3146	0.0914	-	-	-	-
SENILE	0.0805	0.0730	0.0885	0.0871	-	-	-	-
CANCER	0.9712 **	7.0867	1.1456 **	9.0125	-	-	-	-
STROKE	-0.0467	0.0134	-0.1457	0.1269	-	-	-	-

APPENDIX TABLE 1-2-2- Continued

	1982-1984				1984-1989			
	MODEL I Mortality in a nursing home (N→D)		MODEL II Mortality in a nursing home (N→D)		MODEL I Mortality in a nursing home (N→D)		MODEL II Mortality in a nursing home (N→D)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
LUNG	-0.1809	0.2770	-0.2788	0.6441	-	-	-	-
HIPBREAK	-0.0999	0.0257	-0.0135	0.0005	-	-	-	-
NEUROL	-1.0844 *	3.1364	-1.1190 *	3.2443	-	-	-	-
PRIHOSP	0.0893	0.1061	0.0517	0.0360	-	-	-	-
URBAN	-0.0059	0.0005	-0.0372	0.0206	-	-	-	-
LOG_FINC	0.0561	0.9372	0.0468	0.6435	-	-	-	-
LOG_ASST	-0.0404	0.8492	-0.0423	0.9217	-	-	-	-
OWNHOME	0.3854	1.7070	0.3680	1.5158	-	-	-	-
σ	1.1046		1.1050		-		-	
Log-likelihood	-259.147		-258.121					

Note:

Significance: * indicates 5% < p < 10%, and ** indicates p ≤ 5%.

APPENDIX TABLE 1-3: PARAMETRIC HAZARDS ESTIMATES FOR TRANSITION PROBABILITIES OF ELDERLY PERSONS FROM THE COMMUNITY TO A NURSING HOME OR DEATH IN 1982-1989 (WEIBULL DISTRIBUTION) [ESTIMATED BY LIFEREG IN SAS]

	MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)		MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
CONSTANT	-12.2021 **	423.3941	-12.2523 **	425.0855	-10.8173 **	262.0340	-10.8798 **	271.6259
MEDICAID	0.4370	0.0707	-	-	-1.1760	0.5013	-	-
M_NEEDY	-	-	0.2554 **	9.6815	-	-	0.0344	0.1999
H_WAIVER	-	-	-0.1117	1.1103	-	-	0.1071	1.0797
PAS1	-	-	0.1770 **	3.9761	-	-	0.1678 **	3.9099
PAS2	-	-	-0.1015	0.5566	-	-	-0.1530	1.2660
MEDLGRAT	-0.0918	0.1006	-0.1684	0.7061	0.6360 **	5.0342	0.3707 *	3.5621
MEDLGBED	0.0082	0.0008	0.1853	1.2433	-0.2539	0.7464	-0.3310 **	3.9171
LG_PRICE	-0.0724	1.5362	-0.0899	2.4388	0.1059	1.4601	0.0792	0.8774
WHITE	1.0299 **	43.7412	0.9473 **	37.0783	-0.1243	1.4979	-0.1580	2.3311
MALE	0.0640	0.5070	0.0615	0.4689	0.6247 **	58.8879	0.6300 **	59.5261
MARRIED	-0.3260 **	11.0777	-0.3421 **	12.0617	-0.0715	0.6372	-0.0791	0.7725
AGE	0.0575 **	113.0099	0.0572 **	110.9739	0.0618 **	144.2110	0.0619 **	143.7958
HHOLD	-0.1495 **	18.2788	-0.1441 **	17.1702	0.0977 **	12.5007	0.0964 **	12.2158
NCHILD	-0.0966 **	26.1023	-0.0893 **	22.0414	-0.0649 **	14.5277	-0.0614 **	12.9447
ADL1	0.0313	0.1154	0.0174	0.0354	0.2178 **	5.3115	0.2207 **	5.4379
ADL2	0.3148 **	7.7425	0.2946 **	6.7731	0.3505 **	8.7786	0.3358 **	8.0053
ADL3	0.2750	1.7232	0.2498	1.4180	0.5737 **	10.4001	0.5577 **	9.8100
ADL4	0.4153 **	8.5089	0.4191 **	8.6356	0.5242 **	15.3111	0.5435 **	16.3837
ADL5	0.5518 **	17.0901	0.5756 **	18.5482	0.7291 **	39.7726	0.7333 **	40.1477
IADLS	0.7856 **	23.9634	0.7831 **	23.7632	0.6914 **	17.1829	0.6892 **	17.0704
SENILE	0.7604 **	44.6448	0.7857 **	47.7119	0.2910 **	7.4975	0.3178 **	8.9443
CANCER	0.2401	2.3382	0.2506	2.5460	1.0685 **	104.1219	1.0590 **	101.8650
STROKE	0.5595 **	19.0541	0.5552 **	18.7154	0.3149 **	7.5104	0.3159 **	7.5523

APPENDIX TABLE 1-3- Continued

	MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)		MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
LUNG	-0.3007 **	10.1656	-0.3032 **	10.3254	0.2545 **	10.5935	0.2641 **	11.3431
HIPBREAK	0.2071	1.3553	0.1819	1.0344	-0.5091 **	4.3946	-0.5375 **	4.8650
NEUROL	0.3951 **	8.0363	0.4476 **	10.0569	-0.0789	0.2580	-0.0519	0.1107
PRIHOSP	0.1830 **	5.4198	0.2009 **	6.5412	0.5193 **	48.8349	0.5297 **	50.4593
URBAN	-0.0475	0.4161	-0.0819	1.1949	0.1197 *	2.8172	0.1208 *	2.7729
LOG_FINC	-0.0121	0.4529	-0.0098	0.2944	0.0047	0.0778	0.0031	0.0335
LOG_ASST	0.0340 **	7.6080	0.0334 **	7.3284	-0.0057	0.2139	-0.0048	0.1488
OWNHOME	-0.2519 **	10.5751	-0.2251 **	8.3405	0.0966	1.5732	0.1239	2.5512
σ	0.7137		0.7103		1.4402		1.4358	
Log-likelihood	-2,012.393		-2,004.953		-2,828.749		-2,824.153	

Note:

Significance: * indicates 5% < p < 10%, and ** indicates p ≤ 5%.

APPENDIX TABLE 2-1-1: PARAMETRIC HAZARDS ESTIMATES FOR TRANSITION PROBABILITIES OF ELDERLY PERSONS FROM THE COMMUNITY TO A NURSING HOME IN TWO PERIODS: 1982-1984 AND 1984-1989 (EXPONENTIAL DISTRIBUTION) [ESTIMATED BY LIFEREG IN SAS]

	1982-1984				1984-1989			
	MODEL I		MODEL II		MODEL I		MODEL II	
	NH entry risk (C→N)		NH entry risk (C→N)		NH entry risk (C→N)		NH entry risk (C→N)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
CONSTANT	-7.9092 **	135.8393	-7.9087 **	134.8533	-9.5938 **	140.3102	-9.8268 **	141.0724
MEDICAID	1.0458	0.3125	-	-	-3.4033	1.7438	-	-
M_NEEDY	-	-	0.1917 **	3.8946	-	-	0.2600 **	3.9540
H_WAIVER	-	-	-0.1534	1.4504	-	-	-0.0054	0.0010
PAS1	-	-	0.1135	1.1182	-	-	0.1327	0.9067
PAS2	-	-	-0.0899	0.3083	-	-	-0.0173	0.0066
MEDLGRAT	-0.2660	0.6132	-0.1772	0.5916	0.0634	0.0197	-0.5893 *	3.2970
MEDLGBED	-0.0212	0.0044	0.1732	0.8182	0.7675 *	3.0063	0.4452 *	2.7870
LG_PRICE	-0.1389 **	5.3203	-0.1395 **	5.5132	-0.0603	2.3684	-0.0602	2.3663
WHITE	0.9353 **	24.8890	0.8740 **	21.4221	0.9811 **	18.1118	0.9402 **	16.4393
MALE	-0.0416	0.1495	-0.0428	0.1581	0.0756	0.2566	0.0760	0.2589
MARRIED	-0.4160 **	12.3810	-0.4216 **	12.6879	-0.2934 *	2.7430	-0.2921	2.6769
AGE	0.0242 **	15.2290	0.0238 **	14.7486	0.0484 **	31.0078	0.0486 **	30.8941
HHOLD	-0.1238 **	9.0271	-0.1200 **	8.5613	-0.1404 **	6.7244	-0.1371 **	6.4352
NCHILD	-0.0953 **	17.4458	-0.0915 **	16.0038	-0.0700 **	5.5920	-0.0640 **	4.6010
ADL1	0.0422	0.1276	0.0376	0.1011	0.0694	0.2095	0.0779	0.2627
ADL2	0.3635 **	7.4649	0.3574 **	7.2121	0.3487 **	3.9589	0.3553 **	4.1118
ADL3	0.5098 **	4.8814	0.5057 **	4.8031	0.2575	0.4895	0.3047	0.6804
ADL4	0.4578 **	8.0971	0.4649 **	8.3437	0.3475	1.9886	0.4011	2.6267
ADL5	0.6197 **	18.6949	0.6301 **	19.3101	0.5153 **	5.4920	0.5046 **	5.2132
IADLS	1.0031 **	14.9431	0.9937 **	14.6482	0.1251	0.4598	0.1028	0.3095
SENILE	0.3950 **	9.7224	0.4149 **	10.6873	0.8800 **	18.5152	0.9226 **	19.9737
CANCER	0.1606	0.8028	0.1746	0.9470	-0.4006	1.2284	-0.3744	1.0703
STROKE	0.2658 *	3.3667	0.2583 *	3.1730	0.5845 **	6.4883	0.5836 **	6.4709

APPENDIX TABLE 2-1-1 - Continued

	1982-1984				1984-1989			
	MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)		MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
LUNG	-0.2777 **	6.2860	-0.2714 **	6.0071	-0.5573 **	10.5796	-0.5458 **	10.1271
HIPBREAK	0.4589 **	5.5277	0.4581 **	5.4750	0.2389	0.2160	0.2831	0.3031
NEUROL	0.4344 **	8.0722	0.4560 **	8.8309	-0.1898	0.3322	-0.1387	0.1761
PRIHOSP	0.2089 **	5.1882	0.2192 **	5.7037	-0.1257	0.8028	-0.1226	0.7643
URBAN	-0.0820	0.8704	-0.1091	1.5029	-0.1105	0.8739	-0.1383	1.3379
LOG_FINC	0.0069	0.1077	0.0096	0.2081	-0.0207	0.5795	-0.0190	0.4833
LOG_ASST	0.0259 *	3.2321	0.0255 *	3.1231	0.0094	0.2043	0.0073	0.1200
OWNHOME	-0.1622 *	2.9454	-0.1477	2.4151	-0.4218 **	4.8320	-0.4185 **	4.6620
σ	1.0000		1.0000		1.0000		1.0000	
Log-likelihood	-1,586.987		-1,584.334		-957.071		-972.920	

Note:

Significance: * indicates 5% < p < 10%, and ** indicates p ≤ 5%.

APPENDIX TABLE 2-1-2: PARAMETRIC HAZARDS ESTIMATES FOR TRANSITION PROBABILITIES OF ELDERLY PERSONS FROM THE COMMUNITY TO DEATH IN TWO PERIODS: 1982-1984 AND 1984-1989 (EXPONENTIAL DISTRIBUTION) [ESTIMATED BY LIFEREG IN SAS]

	1982-1984				1984-1989			
	MODEL I		MODEL II		MODEL I		MODEL II	
	Mortality in the community (C→D)		Mortality in the community (C→D)		Mortality in the community (C→D)		Mortality in the community (C→D)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
CONSTANT	-9.7333 **	231.0414	-9.7568 **	239.5308	-17.1448 **	157.9600	-17.2247 **	153.9066
MEDICAID	-0.5111	0.0857	-	-	-1.7443	0.1676	-	-
M_NEEDY	-	-	0.0683	0.7738	-	-	0.0107	0.0026
H_WAIVER	-	-	0.0627	0.3568	-	-	-0.2333	0.7610
PAS1	-	-	0.1027	1.4167	-	-	0.3197	1.9479
PAS2	-	-	-0.2110	2.3092	-	-	0.2252	0.5087
MEDLGRAT	0.3926	1.9031	0.2433	1.6687	0.3671	0.2648	0.1883	0.1351
MEDLGBED	-0.2389	0.6120	-0.2426	2.2764	0.1961	0.0637	-0.1045	0.0596
LG_PRICE	0.0617	0.5015	0.0392	0.2184	0.1220 **	5.1016	0.1140 **	4.3322
WHITE	-0.2381 **	5.3418	-0.2663 **	6.4675	1.2798 **	9.8627	1.2375 **	9.0385
MALE	0.4948 **	37.3918	0.4983 **	37.8412	0.8876 **	16.6412	0.8834 **	16.1288
MARRIED	-0.0695	0.5964	-0.0728	0.6495	-3.1355 **	82.9212	-3.1575 **	83.6053
AGE	0.0421 **	70.9052	0.0423 **	71.2497	0.0898 **	45.1961	0.0906 **	44.7843
HHOLD	0.0940 **	12.5137	0.0951 **	12.7895	-0.3124 **	8.8206	-0.3130 **	8.4960
NCHILD	-0.0561 **	10.7016	-0.0537 **	9.7720	-0.0244	0.2420	-0.0167	0.1115
ADL1	0.2288 **	5.5810	0.2252 **	5.3942	-1.7600 **	24.8063	-1.7644 **	24.9431
ADL2	0.2732 **	5.0280	0.2642 **	4.6830	-1.4105 **	12.4885	-1.4257 **	12.7491
ADL3	0.6317 **	12.6246	0.6288 **	12.4967	-22.3835	0.0000	-22.3996	0.0000
ADL4	0.4024 **	8.5807	0.4102 **	8.9046	-1.1094 **	7.3136	-1.1831 **	7.8927
ADL5	0.6959 **	38.1885	0.7053 **	39.0694	-1.6968 **	9.8744	-1.7552 **	10.3043
IADLS	0.5336 **	9.5878	0.5282 **	9.3869	1.7069 **	13.3501	1.7119 **	13.4001
SENILE	0.2432 **	5.3754	0.2520 **	5.7606	0.6972 **	4.2134	0.7454 **	4.7164
CANCER	1.0180 **	97.7108	1.0062 **	95.0132	0.5543 *	3.0821	0.5654 *	3.1525
STROKE	0.2328 **	4.0303	0.2282 **	3.8663	1.2353 **	21.5390	1.2372 **	21.3321

APPENDIX TABLE 2-1-2 - Continued

	1982-1984				1984-1989			
	MODEL I		MODEL II		MODEL I		MODEL II	
	Mortality in the community (C→D)		Mortality in the community (C→D)		Mortality in the community (C→D)		Mortality in the community (C→D)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
LUNG	0.1769 **	4.8788	0.1821 **	5.1534	0.3611 *	2.8081	0.3504	2.6510
HIPBREAK	-0.4629 *	3.4116	-0.4515 *	3.2488	0.0437	0.0035	0.0912	0.0156
NEUROL	-0.0461	0.0845	-0.0282	0.0316	0.8753 **	4.5926	0.8728 **	4.4016
PRIHOSP	0.4524 **	37.1192	0.4553 **	37.3810	1.1741 **	34.3154	1.1719 **	34.2153
URBAN	0.0775	1.1329	0.0659	0.7997	0.1506	0.5678	0.1599	0.6232
LOG_FINC	0.0190	1.2588	0.0190	1.2630	0.0868	2.5848	0.0910 *	2.7508
LOG_ASST	-0.0091	0.5370	-0.0082	0.4339	-0.1466 **	8.4678	-0.1477 **	8.5691
OWNHOME	0.1759 **	5.0346	0.1965 **	6.1834	2.1219 **	82.0444	2.1469 **	82.6190
σ	1.0000		1.0000		1.0000		1.0000	
Log-likelihood	-2,703.785		-2,701.932		-598.987		-597.484	

Note:

Significance: * indicates 5% < p < 10%, and ** indicates p ≤ 5%.

APPENDIX TABLE 2-2-1: PARAMETRIC HAZARDS ESTIMATES FOR TRANSITION PROBABILITIES OF ELDERLY PERSONS FROM A NURSING HOME TO THE COMMUNITY IN TWO PERIODS: 1982-1984 AND 1984-1989 (EXPONENTIAL DISTRIBUTION) [ESTIMATED BY LIFEREG IN SAS]

	1982-1984				1984-1989			
	MODEL I NH discharge risk (N→C)		MODEL II NH discharge risk (N→C)		MODEL I NH discharge risk (N→C)		MODEL II NH discharge risk (N→C)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
CONSTANT	0.0440	0.0007	1.3614	0.6514	-17.0025	0.0000	-16.6385	0.0000
MEDICAID	5.9340	1.8313	-	-	14.7132	1.4937	-	-
M_NEEDY	-	-	0.2495	1.2125	-	-	0.1275	0.1091
H_WAIVER	-	-	-0.5031 *	2.8417	-	-	0.0316	0.0038
PAS1	-	-	-0.1310	0.3039	-	-	-0.3350	0.5980
PAS2	-	-	0.5131	2.2199	-	-	-0.0766	0.0212
MEDLGRAT	-0.8592	1.0607	0.1860	0.1376	-4.1443 *	2.8323	-2.0192	2.0969
MEDLGBED	-0.8383	1.4486	-0.2026	0.2358	-0.6400	0.1362	1.3529	1.4549
LG_PRICE	0.0484	0.0799	0.0203	0.0136	0.1168	0.8144	0.0912	0.6077
WHITE	-0.4539	1.3676	-0.7111 *	3.4611	24.9254	0.0000	24.9547	0.0000
MALE	-0.0886	0.1652	-0.0516	0.0562	-0.5111	1.5577	-0.5173	1.5511
MARRIED	0.2520	1.0196	0.2164	0.7296	-0.0431	0.0113	0.0783	0.0361
AGE	-0.0301 **	4.4136	-0.0366 **	6.5756	-0.1508 **	26.6771	-0.1524 **	26.0803
HHOLD	-0.0013	0.0002	-0.0006	0.0000	0.0340	0.0633	0.0509	0.1328
NCHILD	0.0969 **	4.3311	0.0958 **	4.2474	-0.0285	0.0721	-0.0431	0.1614
ADL1	-0.2858	1.2626	-0.4132	2.5564	-0.9115 **	4.2920	-0.9338 **	4.0038
ADL2	0.1271	0.1914	0.0629	0.0458	-0.1506	0.0666	-0.1809	0.0918
ADL3	-0.1169	0.0633	-0.0954	0.0411	-23.9148	0.0000	-24.1608	0.0000
ADL4	-0.2446	0.4452	-0.2004	0.3086	-0.9694	0.6822	-1.0715	0.8576
ADL5	0.2010	0.4737	0.2044	0.4858	-1.0419 *	3.3965	-0.9668 *	2.9968
IADLS	-0.4841	1.2664	-0.4535	1.0900	-0.2408	0.3285	-0.1659	0.1468
SENILE	-1.2109 **	17.3664	-1.3120 **	19.4207	-1.9106 *	2.8327	-1.9158 *	2.9123
CANCER	-0.2873	0.5519	-0.2873	0.5277	-0.3475	0.0886	-0.2178	0.0308
STROKE	0.4124	2.0654	0.4369	2.2623	-1.4374	1.8380	-1.4570	1.8901

APPENDIX TABLE 2-2-1 - Continued

	1982-1984				1984-1989			
	MODEL I		MODEL II		MODEL I		MODEL II	
	NH discharge risk (N→C)		NH discharge risk (N→C)		NH discharge risk (N→C)		NH discharge risk (N→C)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
LUNG	0.4879 **	4.4161	0.4060 *	3.0238	0.5256	1.5292	0.5697	1.6067
HIPBREAK	0.5576	2.2076	0.6555 *	3.1327	-24.3634	0.0000	-24.1839	0.0000
NEUROL	-0.5868 *	2.8987	-0.6549 *	3.6368	-0.4622	0.1442	-0.3413	0.0844
PRIHOSP	-0.3441 *	2.7898	-0.4172 **	4.2120	0.1362	0.1265	0.0252	0.0041
URBAN	0.5810 **	9.2970	0.6689 **	11.6516	-0.0656	0.0413	-0.1130	0.1226
LOG_FINC	-0.0651	2.3315	-0.0797 *	3.5006	-0.0120	0.0234	-0.0270	0.1136
LOG_ASST	0.0563 *	3.2981	0.0694 **	4.8156	-0.0619	1.2909	-0.0738	1.7398
OWNHOME	-0.0718	0.1088	-0.1748	0.6149	0.0475	0.0092	0.0096	0.0004
σ	1.0000		1.0000		1.0000		1.0000	
Log-likelihood	-498.226		-495.725		-119.584		-119.868	

Note:

Significance: * indicates 5% < p < 10%, and ** indicates p ≤ 5%.

APPENDIX TABLE 2-2-2: PARAMETRIC HAZARDS ESTIMATES FOR TRANSITION PROBABILITIES OF ELDERLY PERSONS FROM A NURSING HOME TO DEATH IN TWO PERIODS: 1982-1984 AND 1984-1989 (EXPONENTIAL DISTRIBUTION) [ESTIMATED BY LIFEREG IN SAS]

	1982-1984				1984-1989			
	MODEL I		MODEL II		MODEL I		MODEL II	
	Mortality in a nursing home		Mortality in a nursing home		Mortality in a nursing home		Mortality in a nursing home	
	(N→D)		(N→D)		(N→D)		(N→D)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
CONSTANT	-8.2009 **	13.3185	-7.2543 **	9.9030	-	-	-	-
MEDICAID	6.5635	1.8340	-	-	-	-	-	-
M_NEEDY	-	-	0.5422 *	3.1464	-	-	-	-
H_WAIVER	-	-	0.0299	0.0056	-	-	-	-
PAS1	-	-	-0.2830	0.7469	-	-	-	-
PAS2	-	-	-0.0564	0.0138	-	-	-	-
MEDLGRAT	-0.5337	0.3009	0.3866	0.3764	-	-	-	-
MEDLGBED	-1.1245	2.0720	-0.2238	0.1837	-	-	-	-
LG_PRICE	0.0054	0.0012	-0.0508	0.1033	-	-	-	-
WHITE	0.2563	0.2601	0.0455	0.0080	-	-	-	-
MALE	0.0929	0.0962	0.0985	0.1072	-	-	-	-
MARRIED	0.4383	1.7248	0.4602	1.8356	-	-	-	-
AGE	0.0379 **	3.9821	0.0330 *	2.8991	-	-	-	-
HHOLD	0.0744	0.4432	0.0907	0.6437	-	-	-	-
NCHILD	-0.1124	2.1089	-0.0963	1.5474	-	-	-	-
ADL1	0.3988	1.5418	0.2648	0.6684	-	-	-	-
ADL2	-0.0355	0.0083	-0.2227	0.3147	-	-	-	-
ADL3	0.0107	0.0003	0.1038	0.0295	-	-	-	-
ADL4	-0.3642	0.4828	-0.3705	0.5107	-	-	-	-
ADL5	-0.5629	1.8651	-0.5647	1.8561	-	-	-	-
IADLS	0.4258	0.1689	0.2704	0.0677	-	-	-	-
SENILE	0.0632	0.0450	0.0714	0.0567	-	-	-	-
CANCER	0.9923 **	7.6337	1.1745 **	9.7977	-	-	-	-
STROKE	-0.0469	0.0133	-0.1617	0.1535	-	-	-	-

APPENDIX TABLE 2-2-2 - Continued

	1982-1984				1984-1989			
	MODEL I		MODEL II		MODEL I		MODEL II	
	Mortality in a nursing home (N→D)		Mortality in a nursing home (N→D)		Mortality in a nursing home (N→D)		Mortality in a nursing home (N→D)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
LUNG	-0.1837	0.2835	-0.2900	0.6891	-	-	-	-
HIPBREAK	-0.0819	0.0172	0.0111	0.0003	-	-	-	-
NEUROL	-1.1091 *	3.3346	-1.1458 *	3.4474	-	-	-	-
PRIHOSP	0.0791	0.0825	0.0415	0.0229	-	-	-	-
URBAN	-0.0010	0.0000	-0.0329	0.0159	-	-	-	-
LOG_FINC	0.0593	1.0368	0.0492	0.7040	-	-	-	-
LOG_ASST	-0.0417	0.8984	-0.0440	0.9917	-	-	-	-
OWNHOME	0.3995	1.8200	0.3824	1.6232	-	-	-	-
σ	1.0000		1.0000		-		-	
Log-likelihood	-259.733		-258.712					

Note:

Significance: * indicates 5% < p < 10%, and ** indicates p ≤ 5%.

APPENDIX TABLE 2-3: PARAMETRIC HAZARDS ESTIMATES FOR TRANSITION PROBABILITIES OF ELDERLY PERSONS FROM THE COMMUNITY TO A NURSING HOME OR DEATH IN 1982-1989 (EXPONENTIAL DISTRIBUTION) [ESTIMATED BY LIFEREG IN SAS]

	MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)		MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
CONSTANT	-9.8673 **	295.8567	-9.8733 **	294.8048	-12.7604 **	389.4869	-12.8164 **	405.7222
MEDICAID	0.5354	0.1086	-	-	-1.3174	0.6141	-	-
M_NEEDY	-	-	0.2278 **	7.7894	-	-	0.0497	0.4138
H_WAIVER	-	-	-0.0991	0.8771	-	-	0.0989	0.9210
PAS1	-	-	0.1479 *	2.7773	-	-	0.2082 **	6.0323
PAS2	-	-	-0.0845	0.3868	-	-	-0.1652	1.4741
MEDLGRAT	-0.1316	0.2074	-0.1730	0.7515	0.6876 **	5.8830	0.3874 **	3.8997
MEDLGBED	0.0123	0.0019	0.1851	1.2529	-0.2616	0.7761	-0.3457 **	4.2849
LG_PRICE	-0.0670	1.3319	-0.0818	2.0425	0.1025	1.3574	0.0722	0.7314
WHITE	0.9758 **	40.5561	0.8987 **	34.2060	-0.1021	1.0071	-0.1463	1.9956
MALE	0.0249	0.0773	0.0195	0.0474	0.6808 **	72.2707	0.6885 **	73.4761
MARRIED	-0.3180 **	10.6791	-0.3288 **	11.3141	-0.0743	0.6860	-0.0866	0.9203
AGE	0.0501 **	90.9311	0.0497 **	88.9753	0.0694 **	188.3425	0.0695 **	187.4943
HHOLD	-0.1401 **	16.2216	-0.1349 **	15.1732	0.0976 **	12.4886	0.0959 **	12.0855
NCHILD	-0.0882 **	22.2069	-0.0821 **	19.0353	-0.0759 **	19.7826	-0.0711 **	17.2731
ADL1	0.0229	0.0616	0.0108	0.0135	0.2411 **	6.5208	0.2425 **	6.5781
ADL2	0.2758 **	5.9736	0.2551 **	5.1010	0.4003 **	11.4583	0.3832 **	10.4455
ADL3	0.2649	1.6081	0.2435	1.3556	0.6337 **	12.7292	0.6128 **	11.8632
ADL4	0.3810 **	7.2525	0.3842 **	7.3510	0.5761 **	18.4512	0.5978 **	19.7881
ADL5	0.4574 **	11.9157	0.4706 **	12.5990	0.8318 **	51.8064	0.8380 **	52.4247
IADLS	0.7237 **	20.4684	0.7236 **	20.4205	0.7434 **	20.1098	0.7428 **	20.0785
SENILE	0.6209 **	30.2646	0.6411 **	32.3403	0.3754 **	12.2992	0.4082 **	14.5456
CANCER	0.1656	1.1156	0.1754	1.2505	1.2089 **	138.9230	1.1960 **	135.4903
STROKE	0.4854 **	14.4588	0.4798 **	14.1019	0.3882 **	11.3936	0.3883 **	11.3904

APPENDIX TABLE 2-3 - Continued

	MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)		MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
LUNG	-0.2946 **	9.8461	-0.2971 **	10.0086	0.2604 **	11.1723	0.2717 **	12.0829
HIPBREAK	0.1993	1.2595	0.1794	1.0120	-0.4895 **	4.0785	-0.5237 **	4.6344
NEUROL	0.3750 **	7.3199	0.4176 **	8.8882	-0.0579	0.1389	-0.0289	0.0343
PRIHOSP	0.1438 *	3.3584	0.1580 **	4.0548	0.5674 **	60.0664	0.5818 **	62.6290
URBAN	-0.0467	0.4054	-0.0783	1.1015	0.1279 *	3.1977	0.1283 *	3.1101
LOG_FINC	-0.0110	0.3781	-0.0086	0.2325	0.0047	0.0766	0.0026	0.0232
LOG_ASST	0.0295 **	5.7917	0.0288 **	5.4992	-0.0057	0.2160	-0.0044	0.1261
OWNHOME	-0.2457 **	10.1506	-0.2222 **	8.1893	0.1087	1.9914	0.1414 *	3.3121
σ	1.0000		1.0000		1.0000		1.0000	
Log-likelihood	-2,072.656		-2,066.939		-2.914.040		-2,907.933	

Note:

Significance: * indicates 5% < p < 10%, and ** indicates p ≤ 5%.

APPENDIX TABLE 3-1-1: PARAMETRIC HAZARDS ESTIMATES FOR TRANSITION PROBABILITIES OF ELDERLY PERSONS FROM THE COMMUNITY TO A NURSING HOME IN TWO PERIODS: 1982-1984 AND 1984-1989 (LOG-LOGISTIC DISTRIBUTION) [ESTIMATED BY LIFEREG IN SAS]

	1982-1984				1984-1989			
	MODEL I		MODEL II		MODEL I		MODEL II	
	NH entry risk (C→N)		NH entry risk (C→N)		NH entry risk (C→N)		NH entry risk (C→N)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
CONSTANT	-29.9746 **	1395.6990	-29.9957 **	1377.6060	-13.4807 **	193.9360	-13.7277 **	191.8479
MEDICAID	1.4951	0.4840	-	-	-4.3412	2.1192	-	-
M_NEEDY	-	-	0.2544 **	5.4941	-	-	0.2968 **	3.9473
H_WAIVER	-	-	-0.1916	1.8115	-	-	0.0098	0.0025
PAS1	-	-	0.1219	1.0248	-	-	0.1351	0.7160
PAS2	-	-	-0.1725	0.8774	-	-	0.0195	0.0065
MEDLGRAT	-0.2310	0.3460	-0.0870	0.1111	0.1344	0.0678	-0.6686 *	3.3147
MEDLGBED	-0.1654	0.2060	0.0982	0.2043	0.9575 *	3.4952	0.5219 *	2.9792
LG_PRICE	-0.2001 **	6.8523	-0.2047 *	7.1532	-0.0577	1.6286	-0.0566	1.5620
WHITE	1.0083 **	24.6530	0.9373 **	21.1170	1.0971 **	17.8914	1.0474 **	16.0047
MALE	0.0494	0.1693	0.0523	0.1899	0.0443	0.0718	0.0391	0.0558
MARRIED	-0.4694 **	12.6405	-0.4770 **	13.0317	-0.3643 *	3.4590	-0.3586 *	3.3113
AGE	0.0365 **	26.2669	0.0364 **	26.0005	0.0606 **	33.8440	0.0606 **	33.5528
HHOLD	-0.1453 **	9.7126	-0.1416 **	9.2705	-0.1697 **	7.5186	-0.1639 **	6.9854
NCHILD	-0.1157 **	20.3728	-0.1113 **	18.7512	-0.0862 **	6.5329	-0.0811 **	5.7694
ADL1	0.0453	0.1215	0.0351	0.0726	0.0626	0.1340	0.0762	0.1971
ADL2	0.3722 **	6.1057	0.3573 **	5.5990	0.3621 *	3.1369	0.3668 *	3.2155
ADL3	0.6080 **	5.2093	0.5941 **	4.9557	0.2643	0.3969	0.3187	0.5759
ADL4	0.5508 **	8.8298	0.5552 **	8.9671	0.3582	1.5632	0.4067	1.9919
ADL5	0.8688 **	26.4671	0.8910 **	27.7038	0.6701 **	6.1576	0.6595 **	5.9363
IADLS	1.0660 **	15.4296	1.0506 **	15.0060	0.1573	0.6111	0.1317	0.4284
SENILE	0.4758 **	9.8963	0.4955 **	10.6898	1.1986 **	20.4962	1.2502 **	21.9035
CANCER	0.3370	2.5678	0.3576 *	2.8835	-0.4855	1.4913	-0.4492	1.2752
STROKE	0.4772 **	7.7115	0.4507 **	6.8349	0.8406 **	8.8457	0.8242 **	8.5607

APPENDIX TABLE 3-1-1 - Continued

	1982-1984				1984-1989			
	MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)		MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
LUNG	-0.3107 **	6.3501	-0.3068 **	6.1744	-0.6243 **	10.8677	-0.6189 **	10.6431
HIPBREAK	0.3899	2.6733	0.4010 *	2.8088	0.1963	0.1072	0.2518	0.1762
NEUROL	0.4215 **	5.1828	0.4461 **	5.7813	-0.3274	0.7556	-0.2718	0.5226
PRIHOSP	0.2899 **	7.8092	0.3034 **	8.5019	-0.1448	0.8193	-0.1336	0.6961
URBAN	-0.0780	0.6151	-0.1148	1.2947	-0.1523	1.2606	-0.1820	1.7563
LOG_FINC	0.0074	0.0959	0.0102	0.1832	-0.0370	1.3478	-0.0365	1.3015
LOG_ASST	0.0292 *	3.1859	0.0288 *	3.0743	0.0116	0.2436	0.0092	0.1520
OWNHOME	-0.1494	1.9902	-0.1330	1.5584	-0.4158 **	3.8463	-0.4244 **	3.9567
σ	0.1305		0.1303		0.5645		0.5644	
Log-likelihood	-897.289		-893.585		-937.711		-935.797	

Note:

Significance: * indicates 5% < p < 10%, and ** indicates p ≤ 5%.

APPENDIX TABLE 3-1-2: PARAMETRIC HAZARDS ESTIMATES FOR TRANSITION PROBABILITIES OF ELDERLY PERSONS FROM THE COMMUNITY TO DEATH IN TWO PERIODS: 1982-1984 AND 1984-1989 (LOG-LOGISTIC DISTRIBUTION) [ESTIMATED BY LIFEREG IN SAS]

	1982-1984				1984-1989			
	MODEL I		MODEL II		MODEL I		MODEL II	
	Mortality in the community (C→D)		Mortality in the community (C→D)		Mortality in the community (C→D)		Mortality in the community (C→D)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
CONSTANT	-11.2667 **	219.6741	-11.2920 **	225.7448	-14.8034 **	78.7059	-14.8557 **	78.0670
MEDICAID	-0.4768	0.0590	-	-	-3.7002	0.6877	-	-
M_NEEDY	-	-	0.0725	0.6616	-	-	0.1153	0.2484
H_WAIVER	-	-	0.0831	0.4900	-	-	-0.2351	0.5801
PAS1	-	-	0.0980	0.9922	-	-	0.4245	2.6203
PAS2	-	-	-0.2491	2.5013	-	-	0.0731	0.0449
MEDLGRAT	0.5234	2.4611	0.3562	2.4707	0.3686	0.2425	-0.1781	0.1024
MEDLGBED	-0.3602	1.0787	-0.3406 *	3.1204	0.6971	0.7314	0.2117	0.2087
LG_PRICE	0.0829	0.7196	0.0580	0.3743	0.0516 **	0.6742	0.0525 **	0.7004
WHITE	-0.2335 **	3.8859	-0.2634 **	4.7550	1.3610 **	9.6317	1.2827 **	8.4929
MALE	0.5875 **	38.1237	0.5906 **	38.5539	0.6753 **	7.6034	0.6614 **	7.2212
MARRIED	-0.0977	0.8804	-0.0997	0.9131	-2.8342 **	52.3254	-2.8679 **	53.2356
AGE	0.0494 **	70.0014	0.0495 **	70.0808	0.0853 **	29.2388	0.0837 **	28.2400
HHOLD	0.1152 **	13.1408	0.1165 **	13.4627	-0.2036 **	3.9643	-0.1955 *	3.6315
NCHILD	-0.0671 **	11.7601	-0.0649 **	10.9701	-0.0134	0.0662	-0.0021	0.0016
ADL1	0.2483 **	5.2319	0.2478 **	5.1943	-1.7605 **	20.9600	-1.7547 **	20.8264
ADL2	0.2806 **	4.1674	0.2748 **	3.9737	-1.4161 **	10.8019	-1.4052 **	10.6199
ADL3	0.7333 **	12.2626	0.7320 **	12.2106	-22.1534	0.0000	-22.8074	0.0000
ADL4	0.4613 **	8.5548	0.4709 **	8.9048	-0.9181 **	4.1182	-0.9047 **	3.9168
ADL5	0.8523 **	40.3045	0.8606 **	41.0462	-1.4725 **	6.6666	-1.4658 **	6.6226
IADLS	0.5803 **	9.7762	0.5745 **	9.5765	1.7312 **	12.2489	1.7300 **	12.1591
SENILE	0.2987 **	5.6672	0.3081 **	6.0200	0.2458	0.3997	0.2944	0.5651
CANCER	1.2897 **	93.6094	1.2840 **	92.5724	0.6523 *	3.1394	0.7190 *	3.7735
STROKE	0.2771 **	3.8960	0.2733 **	3.7897	1.0949 **	10.7617	1.0908 **	10.6575

APPENDIX TABLE 3-1-2 - Continued

	1982-1984				1984-1989			
	MODEL I		MODEL II		MODEL I		MODEL II	
	Mortality in the community (C→D)		Mortality in the community (C→D)		Mortality in the community (C→D)		Mortality in the community (C→D)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
LUNG	0.2235 **	5.8268	0.2296 *	6.1349	0.2820	1.3489	0.2800	1.3299
HIPBREAK	-0.5347 *	3.5546	-0.5360 *	3.5725	-0.2400	0.0771	-0.1409	0.0274
NEUROL	-0.1048	0.3252	-0.0829	0.2025	0.5956	1.6393	0.6236	1.7427
PRIHOSP	0.5385 **	38.6995	0.5420 **	39.0771	0.8339 **	13.5802	0.8372 **	13.5223
URBAN	0.1174	1.9866	0.1063	1.5868	0.2088	0.9313	0.2003	0.8430
LOG_FINC	0.0195	0.9839	0.0201	1.0408	0.0761	1.7499	0.0818	1.9989
LOG_ASST	-0.0055	0.1489	-0.0047	0.1097	-0.1235 **	5.5500	-0.1262 **	5.7689
OWNHOME	0.1881 **	4.3265	0.2081 **	5.2293	1.9462 **	48.6372	1.9717 **	49.7870
σ	0.8087		0.8076		1.7207		1.7117	
Log-likelihood	-2,688.010		-2,685.381		-551.416		-550.093	

Note:

Significance: * indicates 5% < p < 10%, and ** indicates p ≤ 5%.

APPENDIX TABLE 3-2-1: PARAMETRIC HAZARDS ESTIMATES FOR TRANSITION PROBABILITIES OF ELDERLY PERSONS FROM A NURSING HOME TO THE COMMUNITY IN TWO PERIODS: 1982-1984 AND 1984-1989 (LOG-LOGSTIC DISTRIBUTION) [ESTIMATED BY LIFEREG IN SAS]

	1982-1984				1984-1989			
	MODEL I		MODEL II		MODEL I		MODEL II	
	NH discharge risk (N→C)		NH discharge risk (N→C)		NH discharge risk (N→C)		NH discharge risk (N→C)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
CONSTANT	0.4846	0.0620	0.8695	0.2030	-16.0668	0.0000	-16.2848	0.0000
MEDICAID	5.5952	1.3182	-	-	12.9850	1.0957	-	-
M_NEEDY	-	-	0.2459	0.9359	-	-	0.2595	0.2543
H_WAIVER	-	-	-0.4267	1.4977	-	-	-0.1549	0.0546
PAS1	-	-	-0.1319	0.2094	-	-	-0.2989	0.3056
PAS2	-	-	0.5510	1.8236	-	-	-0.3262	0.2290
MEDLGRAT	-1.1850	1.4332	-0.0804	0.0169	-4.4078	2.6460	-2.3193	2.2948
MEDLGBED	-0.4768	0.3711	0.0373	0.0052	-0.0616	0.0013	1.4904	1.4395
LG_PRICE	0.0755	0.1347	0.0767	0.1389	0.1061	0.3506	0.0526	0.1022
WHITE	-0.4821	1.1033	-0.6216	1.8736	25.9185	0.0000	26.7433	0.0000
MALE	-0.2093	0.5987	-0.1740	0.4135	-0.6795	1.4928	-0.6374	1.2699
MARRIED	0.2206	0.5312	0.1955	0.4213	0.1607	0.0836	0.2512	0.2048
AGE	-0.0238	1.9805	-0.0237	1.9808	-0.1938 **	24.5731	-0.1956 **	25.0858
HHOLD	0.0013	0.0002	0.0088	0.0078	0.0338	0.0334	0.0629	0.1142
NCHILD	0.0780	1.7232	0.0694	1.3615	-0.0094	0.0050	-0.0380	0.0781
ADL1	-0.0818	0.0728	-0.1901	0.3866	-1.2694 **	5.2243	-1.2789 **	4.9276
ADL2	0.3756	1.1430	0.3266	0.8569	-0.2404	0.1212	-0.2550	0.1306
ADL3	0.1119	0.0403	0.1652	0.0861	-24.6562	0.0000	-25.5450	0.0000
ADL4	-0.1450	0.1186	-0.1949	0.2145	-1.5728	1.3654	-1.6195	1.4493
ADL5	0.3401	0.9476	0.3510	1.0110	-1.7819 **	5.3071	-1.6690 **	4.8903
IADLS	-0.7758	1.9111	-0.7810	1.8657	-0.1456	0.0676	-0.0596	0.0113
SENILE	-1.2848 **	14.4251	-1.3756 **	16.0015	-2.3520 *	3.5432	-2.4779 *	3.8381
CANCER	-0.0741	0.0269	-0.0058	0.0002	-1.2370	0.5773	-0.8167	0.2245
STROKE	0.5747 *	2.8623	0.6109 *	3.2114	-1.6428	1.9306	-1.7288	2.1125

APPENDIX TABLE 3-2-1 - Continued

	1982-1984				1984-1989			
	MODEL I		MODEL II		MODEL I		MODEL II	
	NH discharge risk (N→C)		NH discharge risk (N→C)		NH discharge risk (N→C)		NH discharge risk (N→C)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
LUNG	0.6664 **	5.4184	0.6561 **	5.1967	0.7206	1.4991	0.7062	1.3553
HIPBREAK	0.5419	1.4883	0.6217	1.9461	-24.4684	9.2410E-09	-24.5963	6.3930E-09
NEUROL	-0.4705	1.4056	-0.5353	1.8015	-0.9164	0.4054	-0.9703	0.4478
PRIHOSP	-0.2723	1.3026	-0.3351	1.9573	0.0193	0.0014	-0.1300	0.0621
URBAN	0.5398 **	5.6612	0.5807 **	6.2031	-0.2420	0.3398	-0.3040	0.5410
LOG_FINC	-0.0654	1.7279	-0.0651	1.7228	0.0105	0.0111	-0.0113	0.0127
LOG_ASST	0.0654 *	3.3197	0.0706 **	3.8078	-0.1029	2.1951	-0.1104	2.4944
OWNHOME	-0.0606	0.0596	-0.1197	0.2265	0.1057	0.0269	0.0381	0.0034
σ	1.4433		1.4313		0.6346		0.6291	
Log-likelihood	-462.289		-460.693		-118.945		-118.862	

Note:

Significance: * indicates 5% < p < 10%, and ** indicates p ≤ 5%.

APPENDIX TABLE 3-2-2: PARAMETRIC HAZARDS ESTIMATES FOR TRANSITION PROBABILITIES OF ELDERLY PERSONS FROM A NURSING HOME TO DEATH IN TWO PERIODS: 1982-1984 AND 1984-1989 (LOG-LOGISTIC DISTRIBUTION) [ESTIMATED BY LIFEREG IN SAS]

	1982-1984				1984-1989			
	MODEL I		MODEL II		MODEL I		MODEL II	
	Mortality in a nursing home (N→D)		Mortality in a nursing home (N→D)		Mortality in a nursing home (N→D)		Mortality in a nursing home (N→D)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
CONSTANT	-7.7034 **	9.0457	-6.9726 **	7.3747	-	-	-	-
MEDICAID	5.6987	1.0363	-	-	-	-	-	-
M_NEEDY	-	-	0.5262	2.3278	-	-	-	-
H_WAIVER	-	-	0.0186	0.0016	-	-	-	-
PAS1	-	-	-0.3597	0.9586	-	-	-	-
PAS2	-	-	0.0849	0.0240	-	-	-	-
MEDLGRAT	-0.3666	0.1096	0.4429	0.3715	-	-	-	-
MEDLGBED	-1.0578	1.3692	-0.2785	0.2113	-	-	-	-
LG_PRICE	-0.0297	0.0241	-0.0582	0.0938	-	-	-	-
WHITE	0.0488	0.0066	-0.2168	0.1238	-	-	-	-
MALE	0.0548	0.0258	0.0742	0.0468	-	-	-	-
MARRIED	0.4557	1.4405	0.4091	1.1306	-	-	-	-
AGE	0.0374 *	2.8911	0.0335	2.2582	-	-	-	-
HHOLD	0.1156	0.8315	0.1423	1.2492	-	-	-	-
NCHILD	-0.1224	1.9931	-0.1070	1.5500	-	-	-	-
ADL1	0.4184	1.2935	0.3278	0.7799	-	-	-	-
ADL2	-0.1015	0.0527	-0.2180	0.2357	-	-	-	-
ADL3	0.1172	0.0272	0.1936	0.0721	-	-	-	-
ADL4	-0.3742	0.4148	-0.4384	0.5689	-	-	-	-
ADL5	-0.6250	1.7361	-0.6135	1.6650	-	-	-	-
IADLS	0.4844	0.1930	0.3477	0.0997	-	-	-	-
SENILE	0.0310	0.0082	0.0385	0.0124	-	-	-	-
CANCER	1.1080 **	6.2576	1.2841 **	7.9611	-	-	-	-
STROKE	-0.0519	0.0126	-0.1126	0.0576	-	-	-	-

APPENDIX TABLE 3-2-2 - Continued

	1982-1984				1984-1989			
	MODEL I		MODEL II		MODEL I		MODEL II	
	Mortality in a nursing home (N→D)		Mortality in a nursing home (N→D)		Mortality in a nursing home (N→D)		Mortality in a nursing home (N→D)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
LUNG	-0.1968	0.2514	-0.2614	0.4317	-	-	-	-
HIPBREAK	-0.1320	0.0361	-0.0563	0.0066	-	-	-	-
NEUROL	-1.1652 *	3.1367	-1.1867 *	3.1573	-	-	-	-
PRIHOSP	0.1897	0.3801	0.1156	0.1414	-	-	-	-
URBAN	-0.0154	0.0029	-0.0160	0.0030	-	-	-	-
LOG_FINC	0.0537	0.6485	0.0505	0.5784	-	-	-	-
LOG_ASST	-0.0450	0.7991	-0.0458	0.8290	-	-	-	-
OWNHOME	0.4157	1.5593	0.4045	1.4237	-	-	-	-
σ	1.0013		0.9988		-		-	
Log-likelihood	-258.713		-257.593					

Note:

Significance: * indicates 5% < p < 10%, and ** indicates p ≤ 5%.

APPENDIX TABLE 3-3: PARAMETRIC HAZARDS ESTIMATES FOR TRANSITION PROBABILITIES OF ELDERLY PERSONS FROM THE COMMUNITY TO A NURSING HOME OR DEATH IN 1982-1989 (LOG-LOGISTIC DISTRIBUTION) [ESTIMATED BY LIFEREG IN SAS]

	MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)		MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
CONSTANT	-14.3993 **	386.8403	-14.4777 **	388.4877	-12.5516 **	255.6413	-12.5914 **	261.3880
MEDICAID	0.6645	0.1075	-	-	-0.9194	0.2088	-	-
M_NEEDY	-	-	0.3167 **	9.9045	-	-	0.0406	0.1858
H_WAIVER	-	-	-0.1160	0.7775	-	-	0.1444	1.3358
PAS1	-	-	0.2088 *	3.5260	-	-	0.1232	1.4005
PAS2	-	-	-0.1350	0.6207	-	-	-0.1955	1.4145
MEDLGRAT	-0.1124	0.0941	-0.1658	0.4430	0.7673 **	4.6739	0.5170 **	4.3965
MEDLGBED	-0.0312	0.0080	0.1873	0.8214	-0.4326	1.4611	-0.4568 **	4.7779
LG_PRICE	-0.1212	2.3220	-0.1410 *	3.2047	0.1433	1.9462	0.1152	1.3187
WHITE	1.2176 **	46.3987	1.1126 **	38.1635	-0.1550	1.4974	-0.1819	1.9754
MALE	0.0899	0.6673	0.0837	0.5770	0.7421 **	55.8703	0.7429 **	55.8588
MARRIED	-0.4556 **	14.9331	-0.4728 **	15.9281	-0.0868	0.6403	-0.0866	0.6338
AGE	0.0734 **	122.0108	0.0729 **	119.8497	0.0742 **	145.1533	0.0740 **	143.5207
HHOLD	-0.1967 **	20.1250	-0.1920 **	19.2758	0.1211 **	12.6756	0.1214 **	12.7511
NCHILD	-0.1258 **	30.4042	-0.1188 **	26.9786	-0.0805 **	15.5883	-0.0781 **	14.5538
ADL1	0.0252	0.0487	0.0097	0.0071	0.2363 **	4.4575	0.2403 **	4.5914
ADL2	0.3991 **	7.7300	0.3608 **	6.2876	0.3595 **	6.3457	0.3481 **	5.8978
ADL3	0.4902 *	3.2565	0.4682 *	2.9595	0.7148 **	10.2496	0.7094 **	10.0831
ADL4	0.6078 **	10.8352	0.6187 **	11.1696	0.6282 **	14.4163	0.6427 **	15.0662
ADL5	0.8327 **	23.8394	0.8450 **	24.6263	0.9408 **	42.5004	0.9451 **	42.8912
IADLS	0.9222 **	25.5376	0.9418 **	26.5249	0.7912 **	18.0633	0.7870 **	17.8449
SENILE	0.8659 **	33.8114	0.9008 **	36.5501	0.3605 **	7.0892	0.3745 **	7.6498
CANCER	0.2855	1.9074	0.2995	2.0871	1.3299 **	90.6684	1.3236 **	89.5330
STROKE	0.7113 **	17.1757	0.6916 **	16.1627	0.3470 **	5.3457	0.3473 **	5.3689

APPENDIX TABLE 3-3 - Continued

	MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)		MODEL I NH entry risk (C→N)		MODEL II NH entry risk (C→N)	
	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square	Coefficient	Chi-square
LUNG	-0.3467 **	9.1313	-0.3558 **	9.6001	0.3403 **	12.3116	0.3431 **	12.4987
HIPBREAK	0.2384	0.9887	0.2374	0.9634	-0.7297 **	6.5187	-0.7471 **	6.7845
NEUROL	0.5349 **	8.3715	0.5794 **	9.7272	-0.1582	0.6736	-0.1274	0.4358
PRIHOSP	0.2730 **	7.6737	0.2924 **	8.7735	0.6620 **	52.9805	0.6669 **	53.6356
URBAN	-0.0449	0.2370	-0.0931	0.9872	0.1761 **	4.0864	0.1764 **	3.9905
LOG_FINC	-0.0132	0.3443	-0.0097	0.1876	0.0042	0.0402	0.0044	0.0438
LOG_ASST	0.0388 **	6.3244	0.0378 **	5.9628	-0.0029	0.0385	-0.0027	0.0320
OWNHOME	-0.3354 **	11.9422	-0.3016 **	9.5381	0.0867	0.8582	0.1101	1.3660
σ	0.5803		0.5772		1.2026		1.1998	
Log-likelihood	-1,973.388		-1,966.007		-2,798.851		-2,795,770	

Note:

Significance: * indicates 5% < p < 10%, and ** indicates p ≤ 5%.

APPENDIX TABLE 4: COMPARISONS OF LOG-LIKELIHOOD VALUES BETWEEN WEIBULL-GAMMA AND OTHER PARAMETRIC HAZARD DISTRIBUTIONS

1982-1984

Distribution	NH entry risk (C→N)		Mortality in the community (C→D)		NH discharge risk (N→C)		Mortality in a nursing home (N→D)	
	MODEL I	MODEL II	MODEL I	MODEL II	MODEL I	MODEL II	MODEL I	MODEL II
Weibull-Gamma	-860.472	-855.339	-2,682.101	-2,680.310	-471.891	-456.385	-248.353	-249.248
Weibull	-876.805	-872.754	-2,698.613	-2,695.229	-466.841	-465.217	-259.147	-258.121
	(-16.333)	(-17.415)	(-16.612)	(-14.919)	(5.505)	(-8.832)	(-10.794)	(-8.873)
Exponential	-1,586.987	-1,584.334	-2,703.785	-2,701.932	-498.226	-495.725	-259.733	-258.712
	(-726.515)	(-728.995)	(-21.684)	(-21.622)	(-26.335)	(-39.340)	(-11.380)	(-9.464)
Log-logistic	-897.289	-893.585	-2,685.381	-2,685.381	-462.289	-460.693	-258.713	-257.593
	(-36.817)	(-38.246)	(-3.280)	(-5.071)	(9.602)	(-4.308)	(-10.360)	(-8.345)

1984-1989

Distribution	NH entry risk (C→N)		Mortality in the community (C→D)		NH discharge risk (N→C)		Mortality in a nursing home (N→D)	
	MODEL I	MODEL II	MODEL I	MODEL II	MODEL I	MODEL II	MODEL I	MODEL II
Weibull-Gamma	-939.024	-936.912	-551.250	-549.984	-109.944	-110.770	-	-
Weibull	-939.061	-936.926	-551.562	-550.236	-116.362	-116.544	-	-
	(-0.037)	(-0.014)	(-0.312)	(-0.252)	(-6.418)	(-5.774)	-	-
Exponential	-957.071	-972.920	-598.987	-597.484	-119.584	-119.868	-	-
	(-18.047)	(-36.008)	(-47.737)	(-47.500)	(-9.640)	(-9.098)	-	-
Log-logistic	-937.711	-935.797	-551.416	-550.093	-118.945	-118.862	-	-
	(1.313)	(1.115)	(-0.166)	(-0.109)	(-9.001)	(-8.092)	-	-

APPENDIX TABLE 4 - Continued

1982-1989

Distribution	NH entry risk (C→N)		Mortality in the community (C→D)		NH discharge risk (N→C)		Mortality in a nursing home (N→D)	
	MODEL I	MODEL II	MODEL I	MODEL II	MODEL I	MODEL II	MODEL I	MODEL II
Weibull-Gamma	-1,945.282	-1,938.473	-2,770.921	-2,769.546	-	-	-	-
Weibull	-2,012.393	-2,004.953	-2,828.749	-2,824.153	-	-	-	-
	(-67.111)	(-66.480)	(-57.828)	(-54.607)	-	-	-	-
Exponential	-2,072.656	-2,066.939	-2,914.040	-2,907.933	-	-	-	-
	(-127.374)	(-128.466)	(-143.119)	(-138.387)	-	-	-	-
Log-logistic	-1,973.388	-1,966.007	-2,798.851	-2,795.770	-	-	-	-
	(-28.106)	(-27.534)	(-27.930)	(-26.224)	-	-	-	-

Notes: (): the differences between the log-likelihood values of the weibull-gamma hazard distribution and those of other parametric distributions. The smaller the difference, the less the effects of unobserved heterogeneity, and, thus, the better the distribution fits the model.

FIGURE 1-1: BUDGET CONSTRAINTS AND INDIFFERENCE CURVES OF A STATE'S GOVERNOR

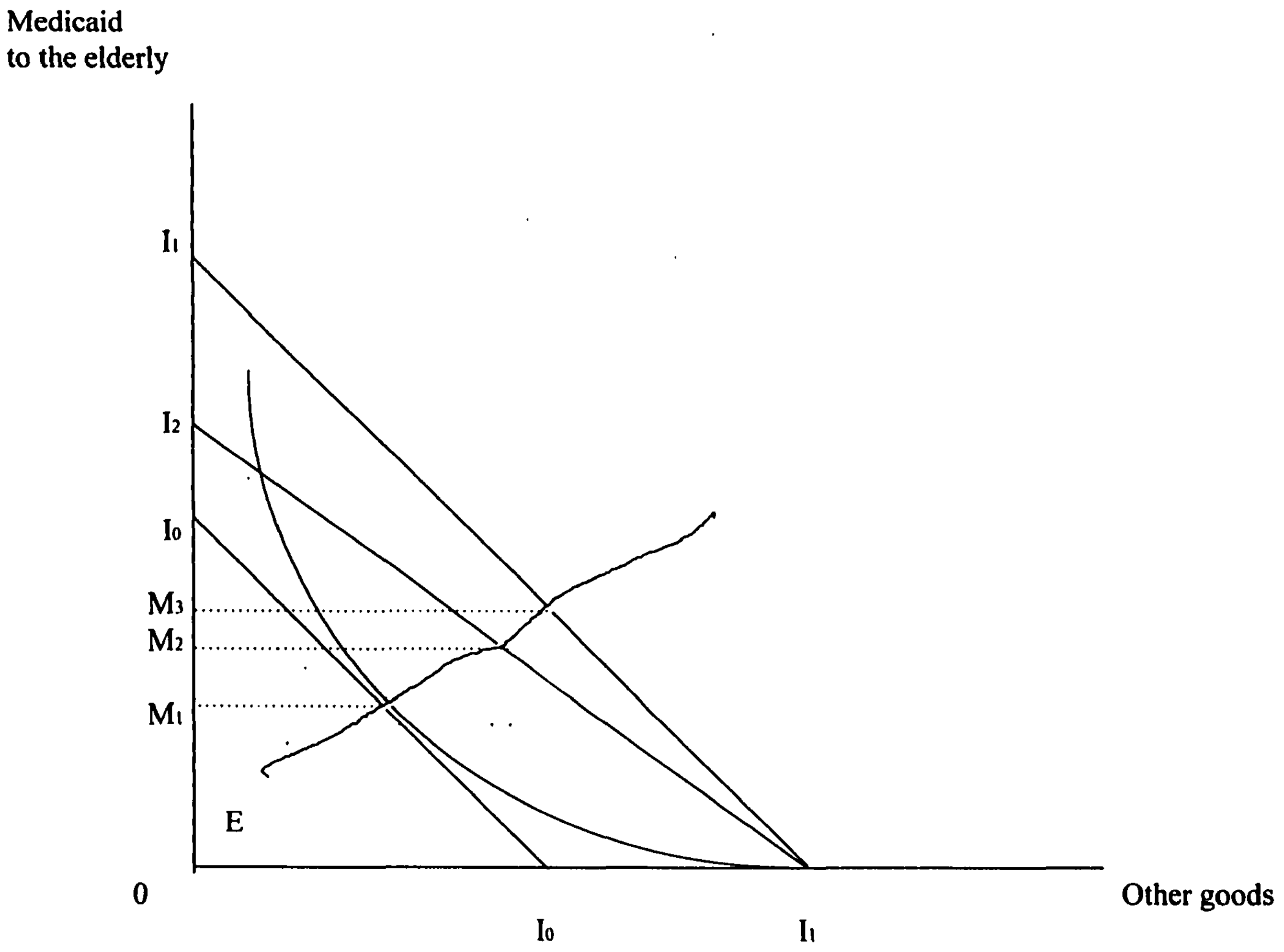


FIGURE 1-2: PRIVATE PLUS MEDICAID NURSING HOME PATIENTS' DEMAND CURVE

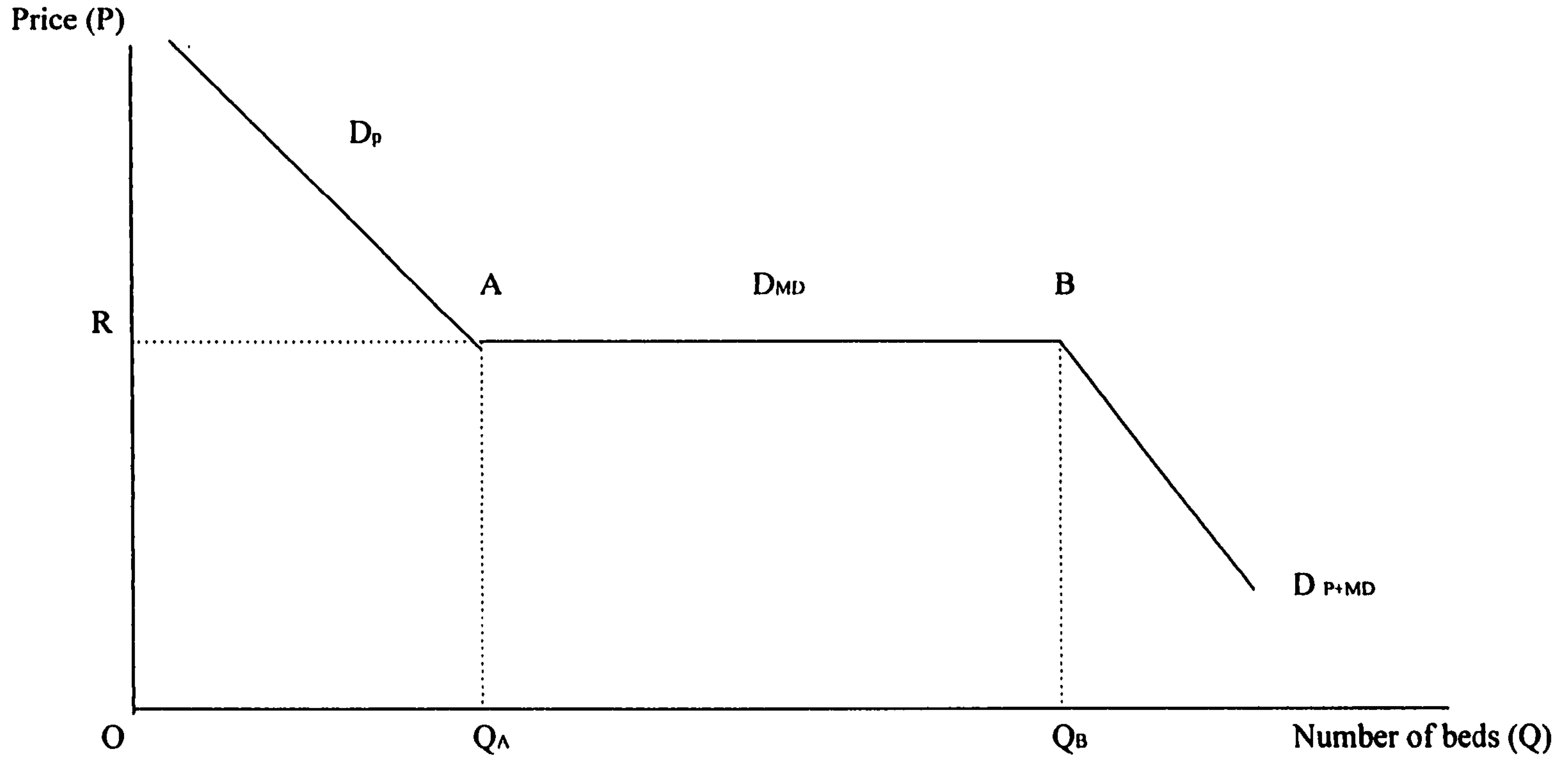
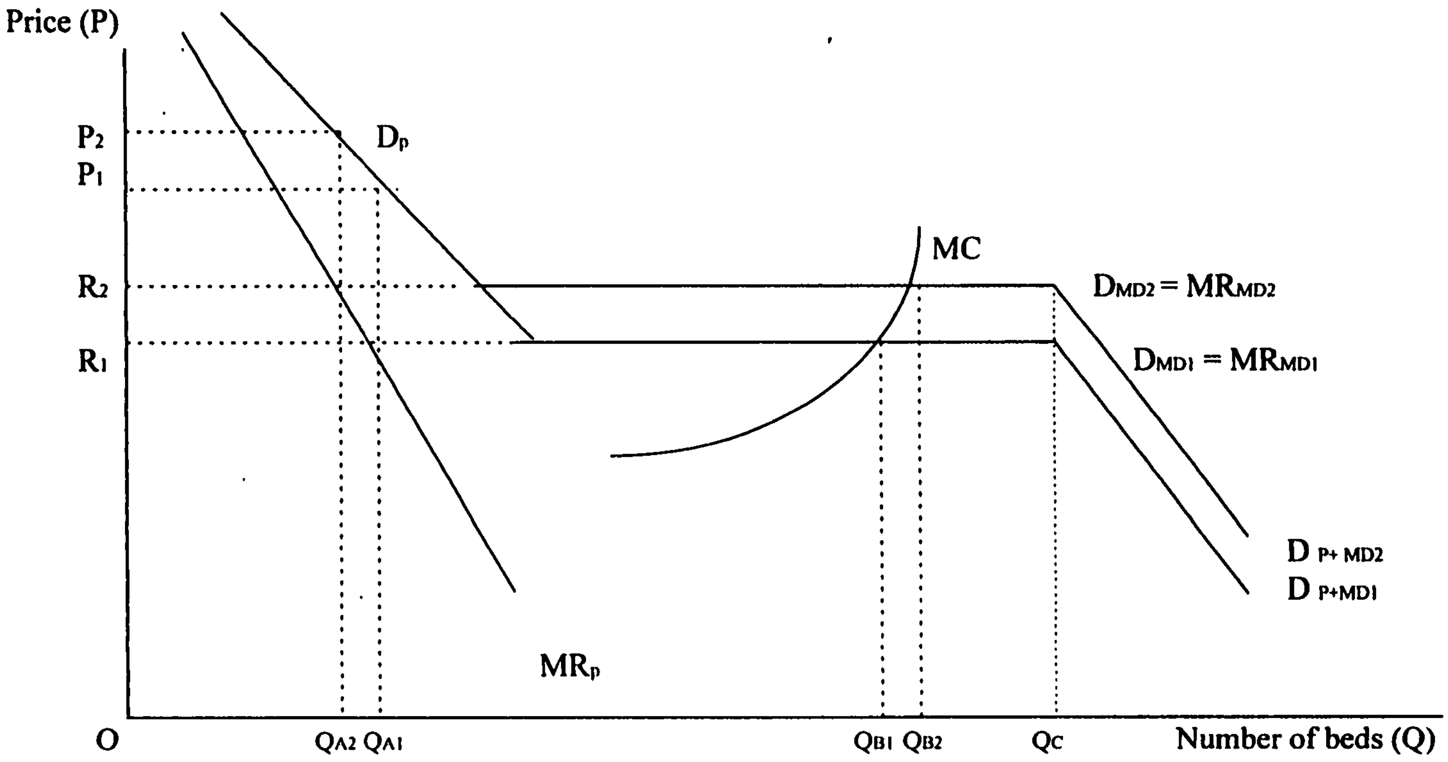


FIGURE 2-1: PROPRIETARY NURSING HOME BEHAVIOR FOR AN INCREASE IN MEDICAID REIMBURSEMENT RATE



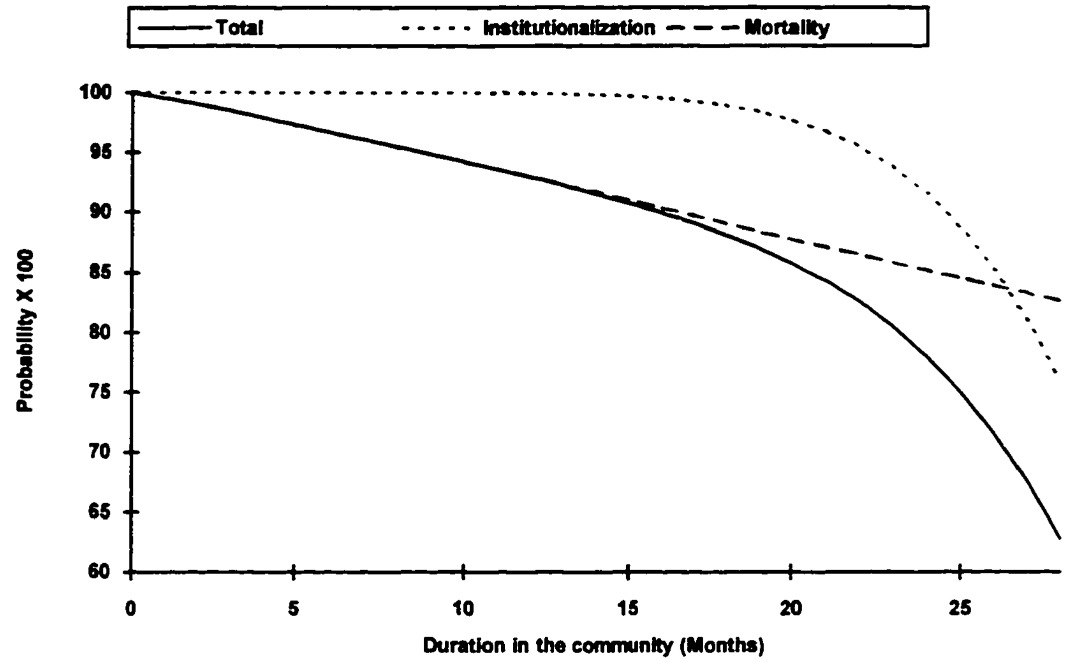


Figure 3-1-1: Survival Distribution of an Individual with Mean Characteristics for the Risks of Nursing Home Entry and Mortality in the Community in 1982-1984 [Based on the Results from Weibull Distribution Estimates: Model II]

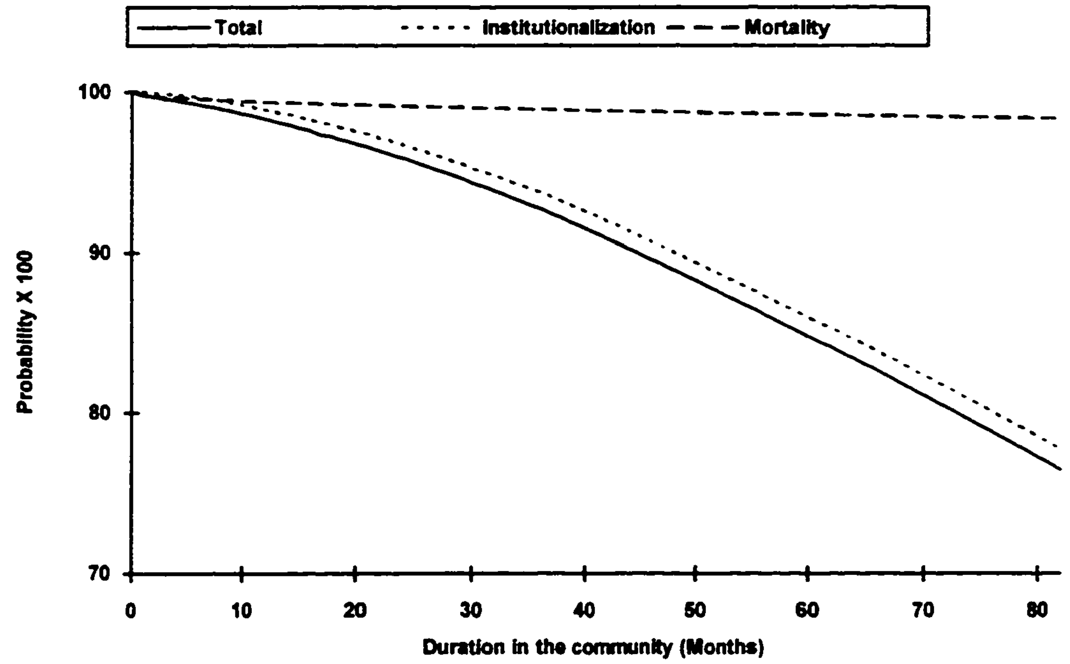


Figure 3-1-2: Survival Distribution of an Individual with Mean Characteristics for the Risks of Nursing Home Entry and Mortality in the Community in 1984-1989 [Based on the Results from Weibull Distribution Estimates: Model II]

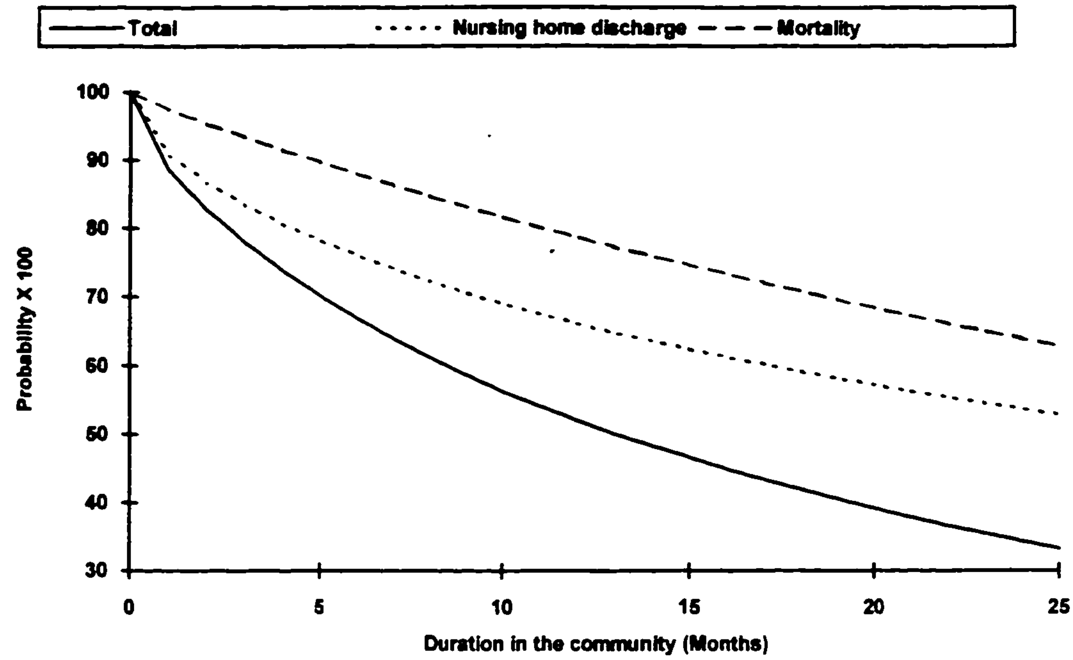
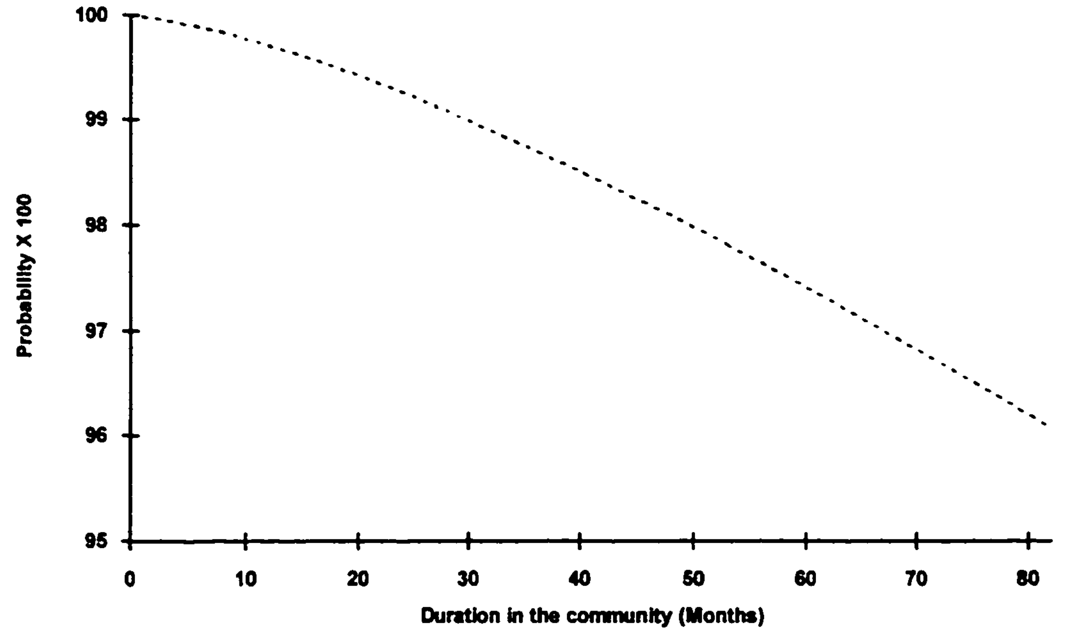


Figure 3-2-1: Survival Distribution of an Individual with Mean Characteristics for the Risks of Nursing Home Discharge and Mortality in a Nursing Home in 1982-1984 [Based on the Results from Weibull Distribution Estimates: Model II]



Notes: no observations who died in a nursing home in 1984-1989.

Figure 3-2-2: Survival Distribution of an Individual with Mean Characteristics for the Risk of Nursing Home Discharge in 1984-1989 [Based on the Results from Weibull Distribution Estimates: Model II]

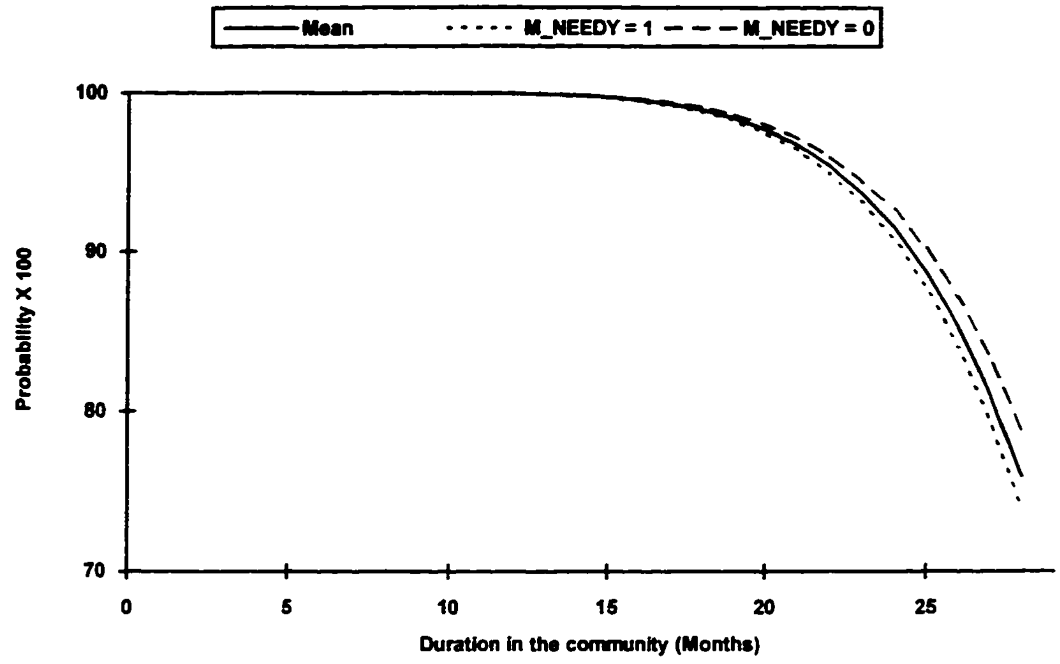


Figure 3-3-1: Distribution of Survival Probability for the Risk of Nursing Home Entry in 1982-1984: Effects of Medically Needy Program [Based on the Results from Weibull Distribution Estimates: Model II]

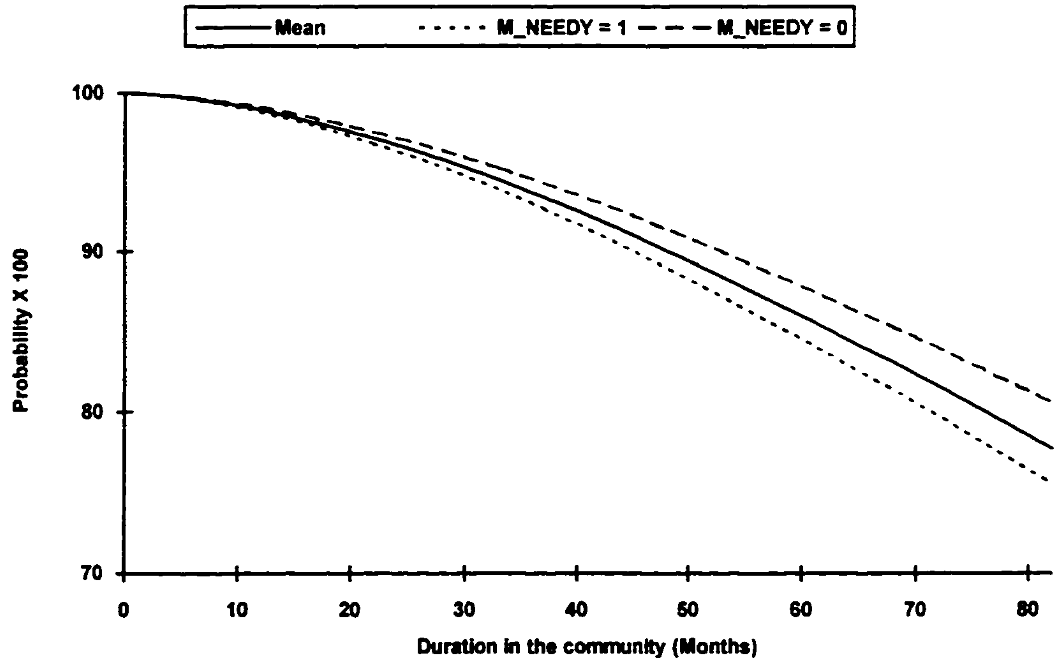


Figure 3-3-2: Distribution of Survival Probability for the Risk of Nursing Home Entry in 1984-1989: Effects of Medically Needy Program [Based on the Results from Weibull Distribution Estimates: Model II]

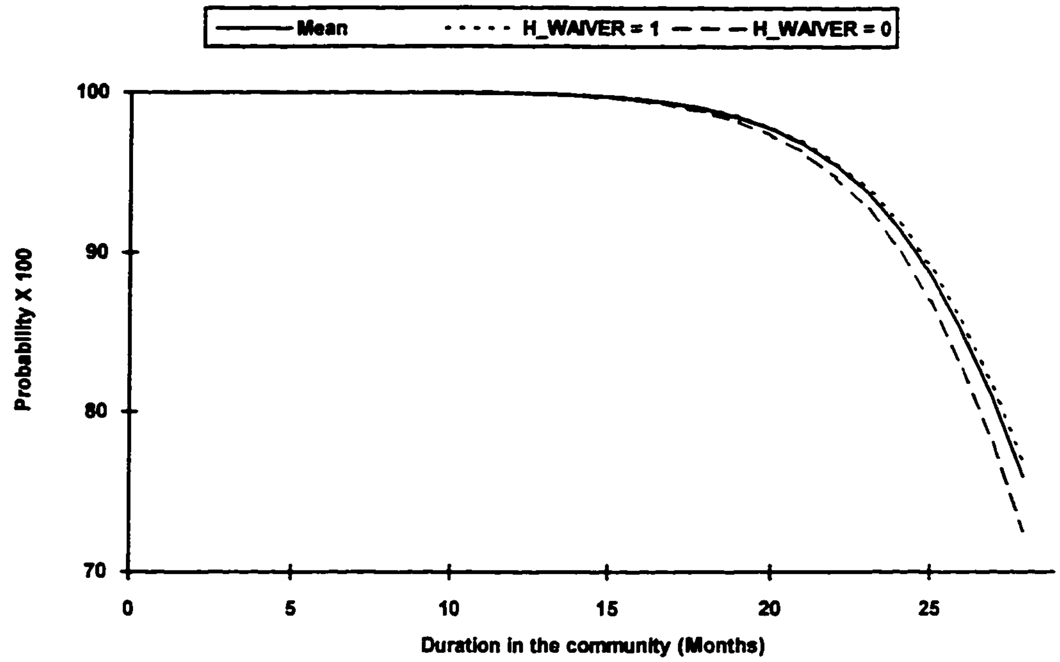


Figure 3-4-1: Distribution of Survival Probability for the Risk of Nursing Home Entry in 1982-1984: Effects of Medicaid Coverage for Home Care [Based on the Results from Weibull Distribution Estimates: Model II]

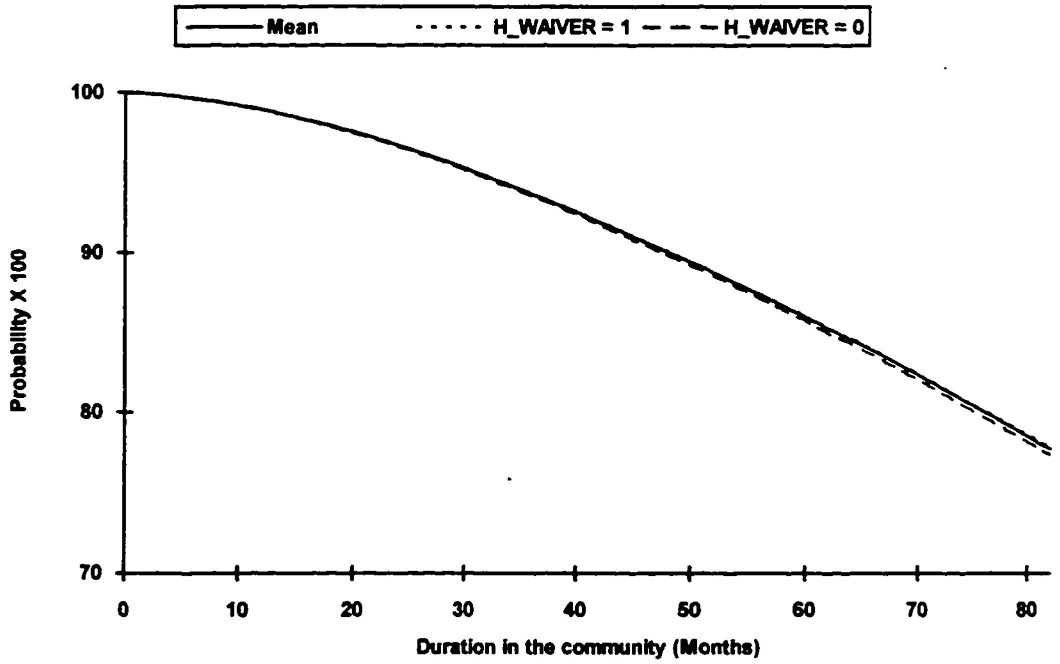


Figure 3-4-2: Distribution of Survival Probability for the Risk of Nursing Home Entry in 1984-1989: Effects of Medicaid Coverage for Home Care [Based on the Results from Weibull Distribution Estimates: Model II]

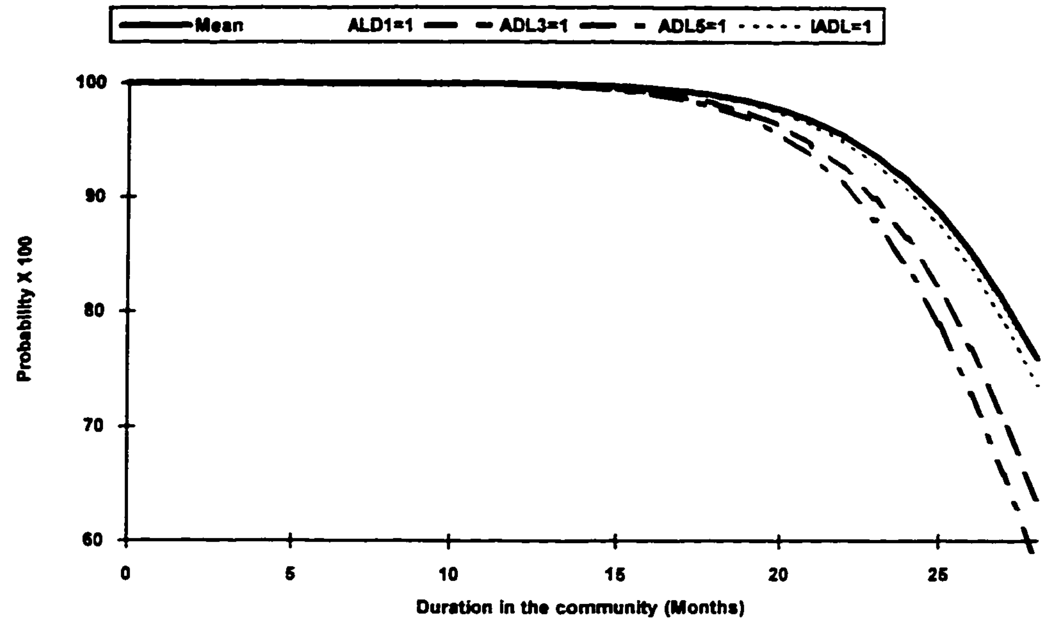


Figure 3-5-1: Distribution of Survival Probability for the Risk of Nursing Home Entry in 1982-1984: Effects of Limitation in ADLs and IADLs [Based on the Results from Weibull Distribution Estimates: Model II]

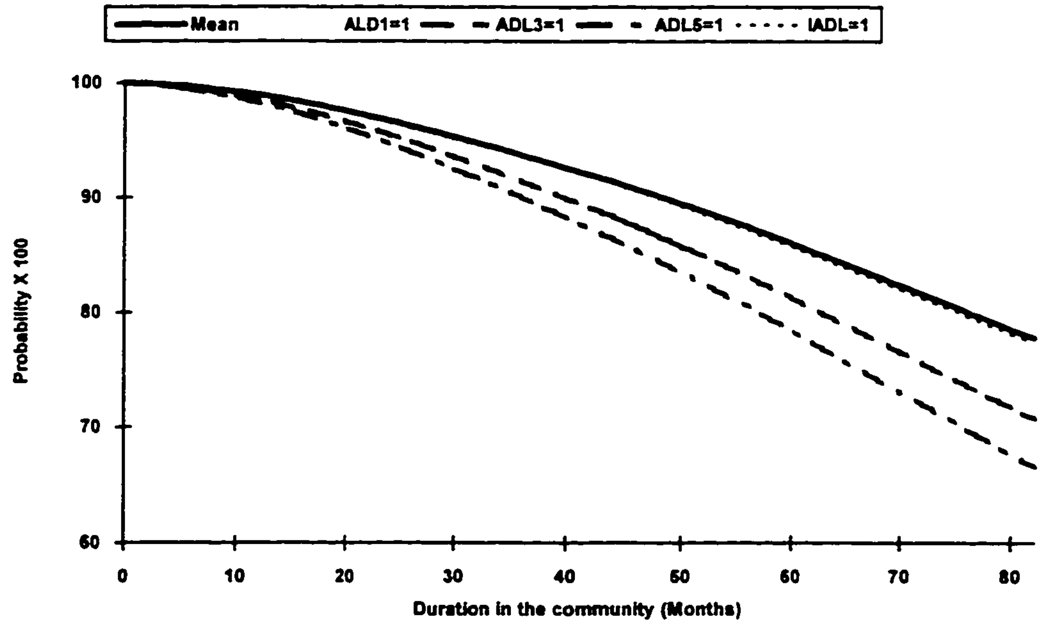


Figure 3-5-2: Distribution of Survival Probability for the Risk of Nursing Home Entry in 1984-1989: Effects of Limitation in ADLs and IADLs [Based on the Results from Weibull Distribution Estimates: Model II]

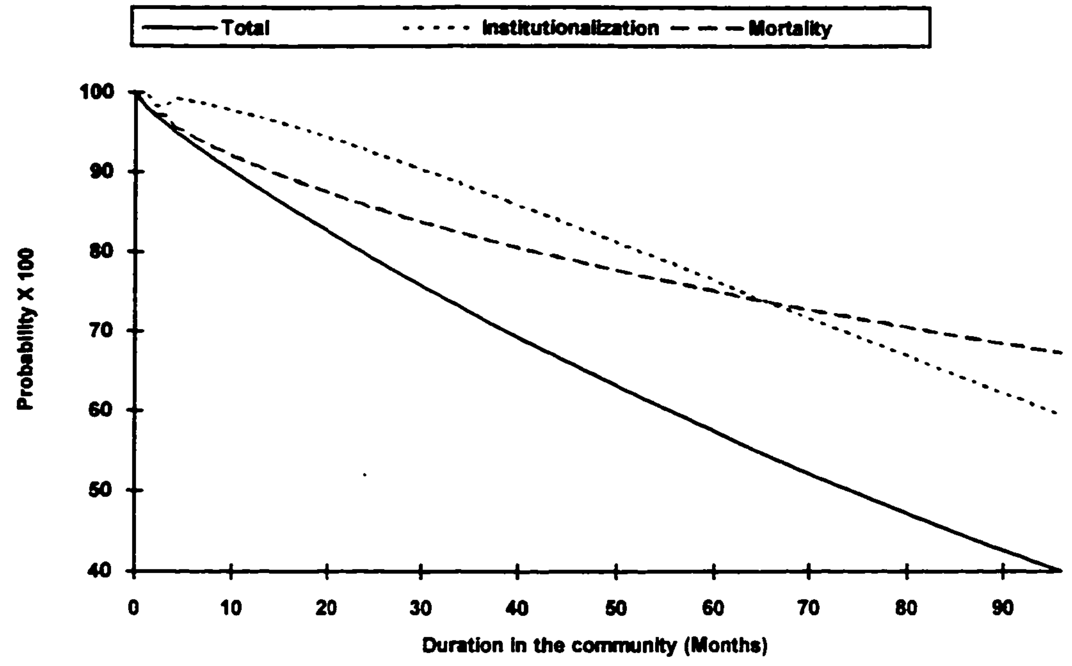


Figure 3-6: Survival Distribution of an Individual with Mean Characteristics for the Risks of Nursing Home Entry and Mortality in the Community in 1982-1989 [Based on the Results from Weibull Distribution Estimates: Model II]

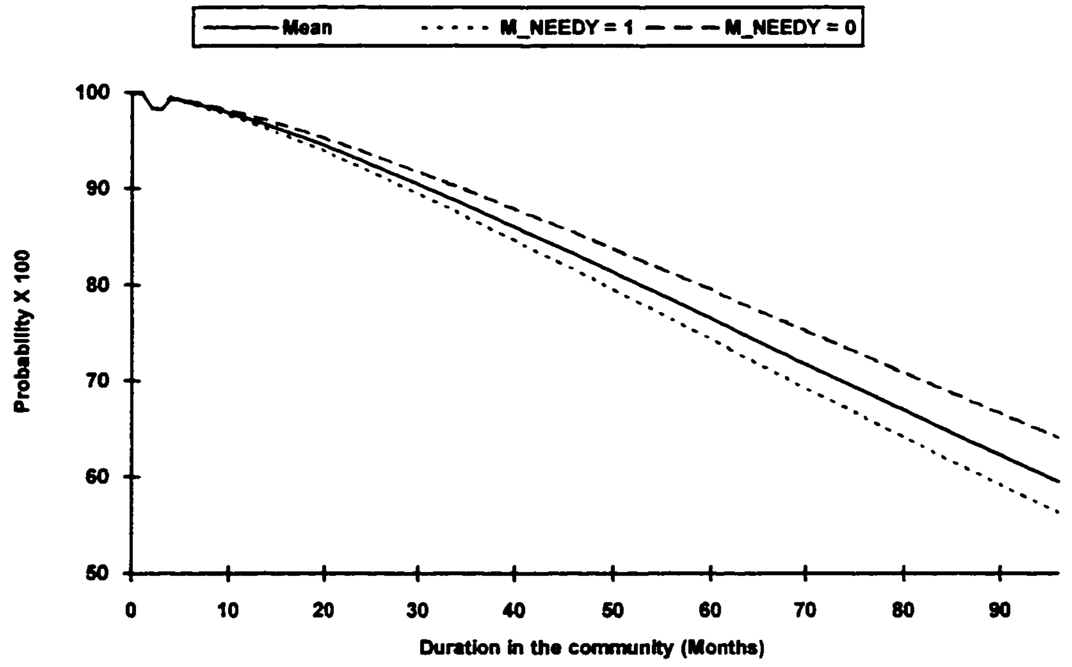


Figure 3-7: Distribution of Survival Probability for the Risk of Nursing Home Entry in 1982-1989: Effects of Medically Needy Program [Based on the Results from Weibull Distribution Estimates: Model II]

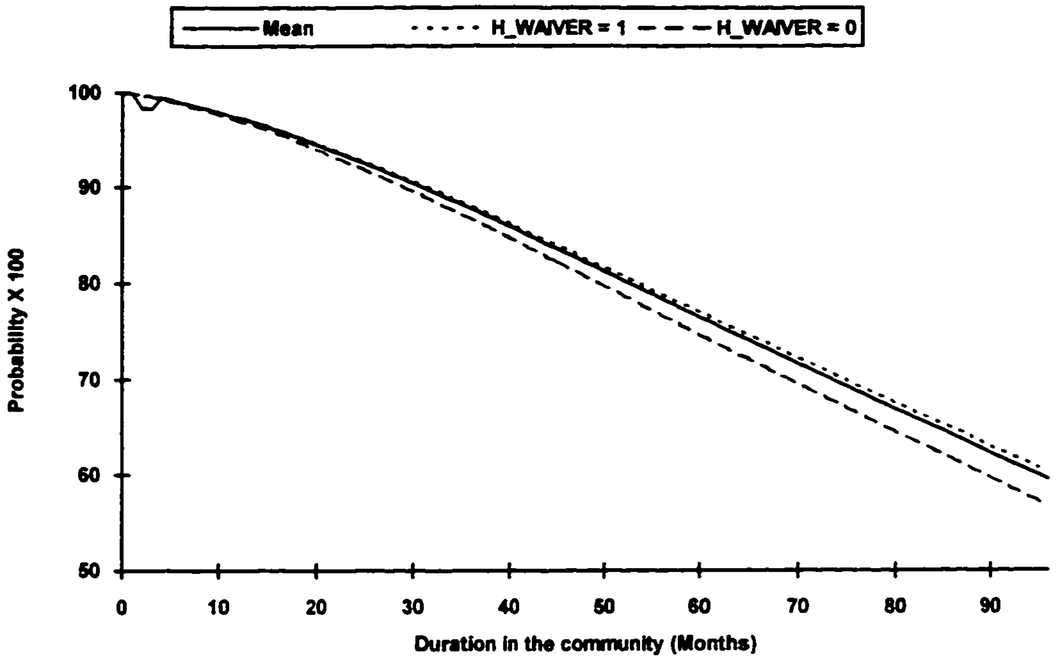


Figure 3-8: Distribution of Survival Probability for the Risk of Nursing Home Entry in 1982-1989: Effects of Medicaid Coverage for Home Care [Based on the Results from Weibull Distribution Estimates: Model II]

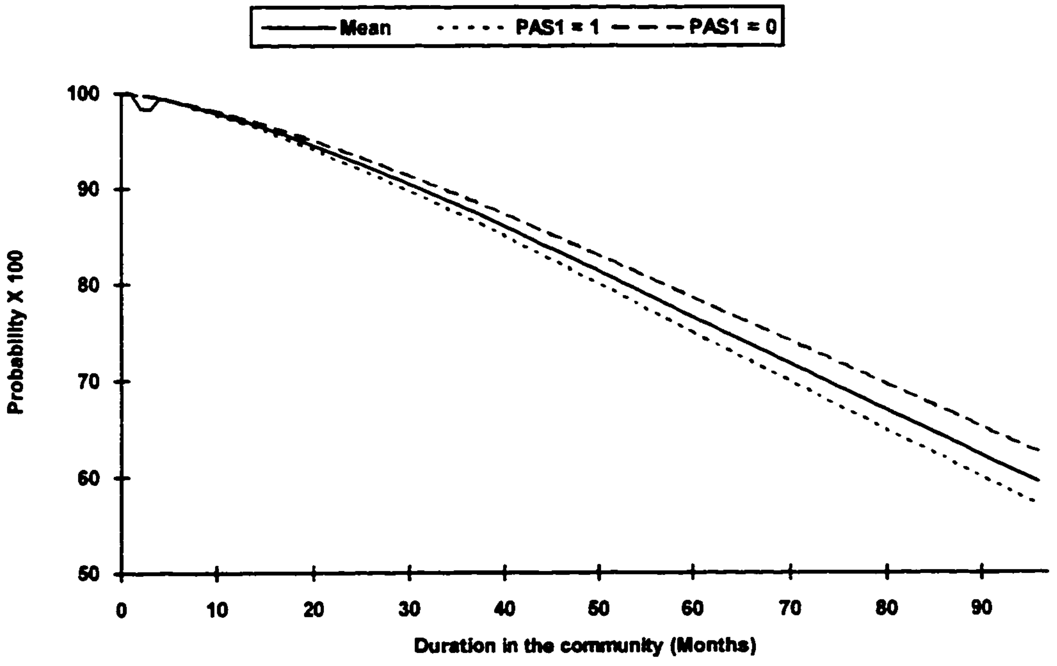


Figure 3-9: Distribution of Survival Probability for the Risk of Nursing Home Entry in 1982-1989: Effects of the Presence of Prescreen 1 Program [Based on the Results from Weibull Distribution Estimates: Model II]

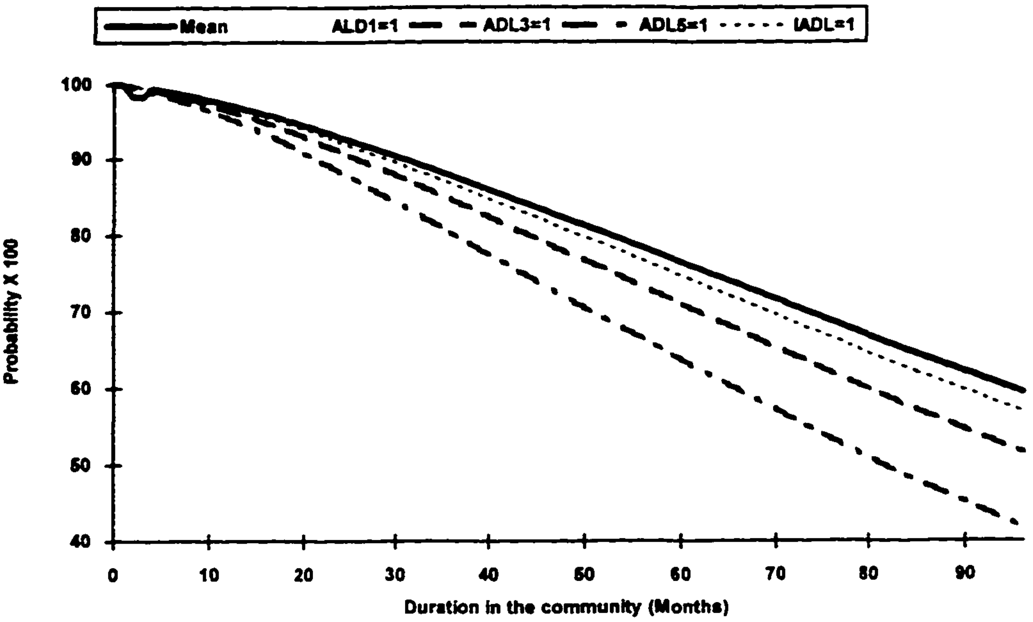


Figure 3-10: Distribution of Survival Probability for the Risk of Nursing Home Entry in 1982-1989: Effects of Limitation in ADLs and IADLs [Based on the Results from Weibull Distribution Estimates: Model II]

Appendix

Unlike a semi-parametric approach, in a parametric approach, an investigator is suppose to know the distribution of tastes over the population of interest. Therefore, a parametric approach requires us to specify the distribution of baseline hazards for each cause j, given the explanatory vector, z. For example, it could be a Weibull, an exponential, a log-logistic, a log-normal, or a gamma distribution; or a mixed distribution, such as a Weibull-Gamma, or an exponential-gamma. The parametric analysis is based on the assumption of homogeneity of the distribution on the basic hazard, the survival function, and the density function, across individuals, because an investigator will assign a distribution form on these functions. This is the disadvantage of using the parametric approaches, as I explained in the section of econometric specification.

Under the Weibull, exponential, and log-logistic regression approaches for competing risks, the cause-specific hazard rates, the survivor, and the cause-specific density functions are defined as the following, respectively:

<u>Weibull distribution</u>

$\lambda j\ (t\,;\bar{z}) = \alpha\ j\lambda_{0\ j\cdot(}\lambda_{0\ j}\ t\ )^{\alpha\ j-1}$ with $t > 0$, $\lambda\ 0j = \exp(z^{\bar{'}}\beta) > 0$, and $\alpha j\ > 0$ ..... Eq. 1

$$S(t\,;\bar{z}) = \exp\,[-\int_0^t \sum_{j=1}^{2} \alpha_j \exp(z^{\bar{'}}\beta_j)[\exp(\bar{z}'\beta_j)u]^{\alpha_j-1}du]$$

$$= \prod_{j=1}^{2} \exp\,[-[\exp(\bar{z}'\beta_j)u]^{\alpha_j}\,\Big|_0^t\,]$$

$$= \prod_{j=1}^{2} \exp[-[\exp(\bar{z}'\beta_j)t]^{\alpha_j}] \text{ .... Eq. 2}$$

$$f_j(t; \bar{z}) = \prod_{j=1}^{2} \alpha_j \exp(z^{\bar{\prime}}\beta_j)[\exp(\bar{z}'\beta_j)t]^{\alpha_j-1} \exp[-[\exp(\bar{z}'\beta_j)t]^{\alpha_j}] \text{.....Eq. 3}$$

Exponential distribution

For the exponential, setting $\alpha_j = 1$ in the Weibull distribution,

$\lambda_j(t ; \bar{z}) = \exp(\overline{z'}\beta\ j)$ with $t > 0$ and $\lambda_{0j} > 0$ .... Eq. 4

where $\bar{\lambda}_0 = \sum_{j=1}^{2} \lambda_{0j}$, $\bar{\lambda}_0$ is a constant hazard rate.

$$S(t ; \bar{z}) = \exp[-\int_0^t \sum_{j=1}^{2} \exp(\overline{z'}\beta\ j)du]$$

$$= \prod_{j=1}^{2} \exp[-\exp(\bar{z}'\beta_j)\Big|_0^t]$$

$$= \prod_{j=1}^{2} \exp[-\exp(\bar{z}'\beta_j)t] \text{ .... Eq. 5}$$

$$f_j(t; \bar{z}) = \prod_{j=1}^{2} \exp(\bar{z}'\beta_j)\exp[-\exp(\bar{z}'\beta_j)t] \text{ .... Eq. 6}$$

Log-logistic distribution

$$\lambda_j(t ; \bar{z}) = \frac{\alpha\ j\exp(\bar{z}'\beta_j)[\exp(\bar{z}'\beta_j)t]^{\alpha_j-1}}{1+[\exp(\bar{z}'\beta_j)t]^{\alpha_j}} \text{ .... Eq. 7}$$

$$S(t; \bar{z}) = \exp[-\int_0^t \sum_{j=1}^{2} \frac{\alpha\ j\exp(\bar{z}'\beta_j)[\exp(\bar{z}'\beta_j)t]^{\alpha_j-1}}{1+[\exp(\bar{z}'\beta_j)t]^{\alpha_j}}du]$$

$$= \prod_{j=1}^{2} \exp\left[-\log[1+[\exp(\bar{z}'\beta_j)u]^{\alpha_j}\right|_{0}^{t}]$$

$$= \prod_{j=1}^{2} \frac{1}{1+[\exp(\bar{z}'\beta_j)t]^{\alpha_j}} \text{ .... Eq. 8}$$

$$f_j(t;\bar{z}) = \prod_{j=1}^{2} \frac{\alpha_j \exp(\bar{z}'\beta_j)[\exp(\bar{z}'\beta_j)t]^{\alpha_j-1}}{1+[\exp(\bar{z}'\beta_j)t]^{\alpha_j}} \frac{1}{1+[\exp(\bar{z}'\beta_j)t]^{\alpha_j}} \text{ ....Eq. 9}$$

The results of the parametric hazard approach shown in Appendix Tables 1-1-1 ~ 3-3 are consistent with the results of semi-parametric estimations. Also, the consistent results were obtained, using different parametric models. The consistency between different approaches shows the reliability of the effect of each explanatory variable on the hazards.

Comparing the log-likelihood values of the parametric approach with those of Weibull-Gamma distribution estimates, we can determine which distribution is less affected by the effect of unobserved heterogeneity, and, thus, which distribution fits the model the best. Appendix Table 4 summarizes the log-likelihood values of three types of parametric estimates based on the Weibull, Exponential, and Log-logistics distributions, and the differences between them and the log-likelihood values of the Weibull-Gamma distribution, which corrects the effects of heterogeneity. The smaller the difference, the less the effects of heterogeneity, and thus, the better the fit of the distribution to the model. The Weibull model is the most appropriate to estimate the hazard of nursing home entry and the log-logistic model is the most appropriate to estimate the other three hazards, that is, the risks of mortality both in the community and in a nursing home and of nursing home discharge. For example, the α estimate of the Weibull model of the hazard of nursing home entry is 0.136 and 0.610 in the study period, 1982-1984 and 1984-1989, respectively, which implies a hazard function continuously increasing over time. The fact that, compared with other models, the hazards of nursing home entry are relatively monotonically increasing supports the idea that the Weibull model is the best to estimate the risk of institutionalization. In both study periods, 1982-1984 and 1984-1989, the difference between the log-likelihood values of the Weibull and of the Weibull-Gamma distribution is the smallest (Appendix Table 4).

In contrast, the Weibull model is clearly inappropriate for estimating the probability of death both in the community and in a nursing home because the Weibull distribution allows only for monotonic hazard rates. The hazards of mortality are not monotonic at all. The log-logistic distribution fits the best for the mortality risk both in the community and in a nursing home. In all three single-period models, the differences between the log-likelihood values of the log-logistic and of the Weibull-Gamma distribution are the smallest (Appendix Table 4).

As discussed in the section 1-1 of Chapter 3, most people depart from a nursing home either through discharge or through death within a relatively short period of time. One would expect people to at be less risk of exit from a nursing home within a given period if they have been already remained in a nursing home for a fairly long period of time. The hazard function of a log-logistic distribution allows for declines in hazard rates given sufficient time (Jaggia S. and S. Thosar, 1995).

Thus, the log-logistic model could be the most appropriate for estimating hazards of nursing home discharge and mortality in a nursing home. However, Appendix Table 4 shows that, only in Model II of the study period 1982-1984, the log-logistic model for estimating the risk of nursing home discharge is the less influenced by heterogeneity, compared with other distribution. In the other model, the Weibull distribution fits the best for estimating the probability of a nursing home discharge in both study periods, 1982-1984 and 1984-1989. Therefore, based on these results, we cannot conclude which distribution is the most appropriate to estimate the risk of an individual's nursing home discharge.

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