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The Determinants of Exit from Nursing Homes and the Price Elasticity of Nursing Home Care: Evidence from Japanese Micro-level Data

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The Determinants of Exit from Nursing Homes and the Price Elasticity of Nursing Home Care: Evidence from Japanese Micro-level Data[1]

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ABSTRACT

This study examines how the price mechanism affects the length of residents' nursing home stay and their destination after exit. The purpose of this analysis is to evaluate policy options to reduce the number of socially institutionalized elderly nursing home residents in Japan. To address these issues, we take advantage of micro-level data from *The Survey on Care Service Providers* compiled by the Japanese government. Our duration estimates show that the price elasticity of the hazard of exit from welfare care facilities was 1.7 (95% CI: 0.4-3.0) and 1.8 (95% CI: 0.0-3.8) from health care facilities. The probit estimates show that a 1 percentage point increase in copayments leads to an increase in the probability of returning home by 0.04% for patients of welfare care facilities and 3.7% for those of health care facilities. In contrast, the price elasticity of the probability of being re-hospitalized is -3.3% for patients of health care facilities and -1.9% for those of medical care facilities. An appropriate price policy may work well to shorten patients' length of stay and to reduce the number of the socially institutionalized. Since the effects of the introduction of a price mechanism may differ for different types of facilities, public policies aimed at broadening residents' range of choices need to be designed with care and incorporate an appropriate risk adjustment system to provide a safety net for those elderly highly at risk of being socially institutionalized.

Key words. Japanese long-term care insurance, social institutionalization, price elasticity; *the Survey on Care Service Providers*; institutional care

INTRODUCTION

One of the most serious challenges facing Japan today is the rapid aging of its population and the ballooning costs of the medical and long-term care systems

associated with this trend. In the last decade, medical care expenditure for the aged (those 70 years of age and older) increased from approximately 6 trillion yen to11 trillion yen, and its share in total medical expenditure grew from 30% to 37% (Statistics Bureau 2004). Long-term care costs rose six-fold from about 0.6 trillion yen to 3.6 trillion yen in the same period (Statistics Bureau 2004). Long-term care consists of institutional care provided by nursing homes and formal or paid home-care.

A large share of these costs is accounted for by the growing numbers of "socially hospitalized" patients and "socially institutionalized" nursing home residents. Patients are defined as "socially hospitalized" if they no longer require acute medical care but remain hospitalized for more than 180 days, because they require some form of care, but have no informal or unpaid caregivers (such as relatives) or sufficient financial resources to afford formal home care. In the same way, nursing home residents are defined as "socially institutionalized" if their medical condition would allow them to live at home, provided they receive adequate formal or informal home care; but because of the lack of such home care, for family or financial reasons, they often remain in nursing homes until they die. Many European countries facing similar problems of spiraling health care costs have tried to rein these in by introducing policies aimed at transferring patients from medical to long-term care institutions and from institutional to home care.

In order to tackle the issues of social hospitalization and institutionalization, the Ministry of Health, Labour and Welfare (MHLW) introduced the public long-term care insurance scheme in 2000 (Mitchell, Piggott and Shimizutani 2004). [2] Key aspects of the scheme include the following. The "firewall" between medical and long-term care services was abolished and patients can now choose from a variety of institutions

providing a wide range of health care services. More importantly, the new scheme introduced the price mechanism to the home care market for the elderly: users must now pay 10% coinsurance for each insured care service.

Along with the introduction of the public long-term care insurance scheme, MHLW initiated medical care reforms to decrease the number of socially hospitalized patients. In an attempt to separate long-term care insurance and health care insurance expenditures, MHLW encourages hospitals to set up wards for long-term care that are separate from wards for acute medical care. The separated wards (called long-term medical care wards) are intended to support patients while preparing to transfer them from acute medical care to low-level home care. A further element of the reform is that the coinsurance rate for insured care services now rises from 10% to 15% when a patient occupies an acute-care bed for more than 180 days.

These reforms are expected to reduce the number of socially hospitalized patients by transferring them to other care institutions. Yet, this strategy can be only part of the solution of the problem of social institutionalization. Once socially hospitalized patients move from hospital to nursing home, many then become socially institutionalized nursing home residents. Thus, all the reforms have achieved is to transfer health care costs for the elderly from the medical care to the long-term care system. The next step therefore has to be to find ways to transfer socially institutionalized nursing home residents to home care. Using the price mechanism can provide one important instrument in such a strategy.

As far as we are aware, there has been little quantitative research on these issues. Yet, without such research, it is difficult to determine how effective price signals are in steering the elderly from institutional to home care. The effectiveness of

price signals is a particularly pertinent question for policy formulation, since the prices of insured care services are regulated by the central government. The primary purpose of this study therefore is to examine the effect of copayment on the demand for nursing home care as a proxy for the price elasticity of demand for institutional care. To this end, we estimate a duration model to evaluate the effect of prices on the length of elderly persons' nursing home stay. We also estimate a probit model in order to examine how prices may affect the number of socially institutionalized nursing home residents and how prices influence an elderly person's destination after exit from nursing home. If the price mechanism works, an appropriate pricing policy may help to shorten the average length of residents' nursing home stay and to reduce the number of socially institutionalized residents.

PREVIOUS RESEARCH

As far as we know, no empirical research has been carried out that analyzes the exit of nursing home residents in Japan. We are therefore forced to focus in our literature review on studies conducted in the United States. Yet, even among the many studies that examine the demand for long-term care and the entry and exit of nursing home residents in the United States, there are relatively few that focus on economic factors such as the price of nursing home services, residents' income, and assets. Since the key issue to be examined in this study is whether the price mechanism has an effect on nursing home use, we concentrate in our review on those studies that have investigated the price elasticity of demand for institutional care.

One such study is the one by Chiswick (1976), who used aggregate cross-section data to estimate the price elasticity of nursing home demand and

concluded that a one percent increase in price reduces demand by 2.3 percent. Using state-level data to measure price elasticity, Scanlon (1980) found that a one percent price increase reduces nursing home demand by 1.1 percent. Garber and MaCurdy (1989), instead of looking at price elasticity, examined factors that affected the likelihood of admission to a nursing home. Using a transition probability model, they found that the likelihood of being admitted to a nursing home was lowered by home ownership and co-residence with children but not related with income. Ingram and Kleinman (1989) used a discrete-time hazard function approach and concluded that home ownership decreased the likelihood of entering a nursing facility while living alone increased it. The effects of other factors such as income, marital status, and the availability of informal home care were found to be not significant. Finally, Headen (1993) examined the price elasticity of nursing home entry using micro-level data and the Cox proportional hazard model. He concluded that the hazard of nursing home entry was reduced by wealth but enhanced by the opportunity cost of informal caregivers' time. The estimated price elasticity of the hazard of nursing home entry was -0.7.

The results show that, to some extent, the price mechanism works to reduce the demand for nursing home care, controlling for various risk factors that affect the likelihood of institutionalization. Although the characteristics of the nursing home industry in the United States are very different from those in Japan, the results support our empirical hypothesis that an appropriate pricing policy would contribute to solving the problem of social institutionalization.

DATA

The data utilized in this study are micro-level data from the *Survey on Care Service Providers* (*Kaigo Service Shisetsu Jigyosho Chosa*) conducted by MHLW. The survey has been performed annually since 2000, when the public long-term insurance scheme was introduced. The data used for this study are from the survey conducted in September 2000, as we were unable to access a more recent version. The survey is a census and contains detailed information on the characteristics of each facility, including the type and quantity of care services provided, and on each resident staying in a facility, including information on age, health, family status, and the amount of copayment.

It may be useful at this point to briefly describe the characteristics of different types of institutions in Japan's nursing home industry. Three types can be distinguished: long-term care welfare facilities for the elderly (henceforth, "welfare care facilities"); long-term care health facilities for the elderly (henceforth, "health care facilities"); and long-term care medical facilities for the elderly (henceforth, "medical care facilities"). Welfare care facilities are designed to provide institutional care service for those who require constant care but who do not live with any informal caregivers at home. These facilities do not provide medical care and residents often remain until they die. In contrast, the other types of nursing home offer medical treatment. Health care facilities aim to offer institutional care for elderly persons in transition from hospital to home care. Residents are in a stable condition and require rehabilitation, long-term care or medical care, but do not require hospitalization.[3] Finally, medical care facilities offer care for residents who need constant clinical intervention such as catheterization.

The total sample consists of 87,687 residents in 4,463 welfare care facilities;

87,555 residents in 2,667 health care facilities; and 39,065 residents in 3,930 medical care facilities. From the total sample, we use only those observations for which the length of stay is available. The cut-off date is September 30, 2000, and if a resident was staying at a nursing home on this date, we treated the duration of stay as being truncated. Further, we confine our sample to observations for which information on personal characteristics (age and family status) and health status on admission are available. After these eliminations, the number of residents in the sample falls to 1,556 (2% out of 87,687) in welfare facilities, 14,134 (16% out of 87,555) in health care facilities, and 2,828 (7% out of 39,065) in medical care facilities. Because detailed information on residents is most likely to be missing for those institutionalized a long time ago, our estimates are likely to be biased.

Table 1 reports the basic statistics for the sample by type of nursing home. The mean length of stay is about 1,440 days for welfare care facilities, 185 for health care facilities, and 395 for medical care facilities. The longer stay in welfare care facilities is consistent with the exit pattern for elderly residents described above. Copayment is highest in health care facilities, followed by medical care facilities. Clinical treatment provided by health and medical care facilities is more costly than the provision of help with everyday tasks provided by welfare care facilities. Men make up the majority residents in all types of facilities, with their share ranging from 73% in welfare care facilities to 65% in medical care facilities. The average age of residents ranges from 85 years in the former to 82 years in the latter. Finally, the residents most likely to receive informal care from relatives are those in health care facilities (26.6%), followed by those in medical care facilities (23.9%), while only 20.2% of welfare care facility residents receive informal care. Looking at residents' health status by type of

nursing home, those in welfare care facilities typically require the greatest level of care, are more likely to suffer from dementia, and are more likely to be bedridden. Adjusting for these key variables, in the next section we estimate the effect of copayment on the demand for nursing home care as a proxy for the price elasticity of demand for nursing home care. Since welfare, health, and medical care facilities provide completely different kinds of services, we examine the price elasticity in each type of facility care market separately.

THE DETERMINANTS OF THE LENGTH OF NURSING HOME STAYS

Suppose that the optimal health stock of elderly person *i* is given by H_i^* and is a function of his or her investments in three types of long-term care: nursing home care (C_i^N), formal or paid home care (C_i^F), and informal or unpaid home care (C_i^I). P^N and P^F are the prices of nursing-home care and formal home care, while P^I represents informal caregivers' opportunity cost. Under these circumstances, we can derive the conditional demand functions for nursing home, formal, and informal home care as follows:

(1.1) $C_i^N = C_i^N(P^N, P^F, P^I \mid H_i^*)$

(1.2) $C_i^F = C_i^F(P^N, P^F, P^I \mid H_i^*)$

(1.3) $C_i^I = C_i^I(P^N, P^F, P^I \mid H_i^*)$

where $\partial C_i^N / \partial P^N < 0$, $\partial C_i^F / \partial P^F < 0$, and $\partial C_i^I / \partial P^I < 0$. This model shows that the demand for each type of long-term care depends on both its own price level and the relative price of other forms of care. In this study, we focus on the effect of prices, P^N, P^F, and P^I, on the demand for nursing home care, C_i^N. Applying a duration

model to the demand function, we define the demand for nursing home care C_i^N as the length of an individual nursing home stay. Therefore, the survival and hazard functions of timing to exit are defined as follows:

$$(2.1)\quad S_d(t_d;P^N,P^F,P^I,H,Z)=P(T_d>t_d\mid P^N,P^F,P^I,H,Z)=e^{-\int_0^{t_d}\lambda_d(u_d;P^N,P^F,P^I,H,Z)du}$$

$$(2.2)\quad \lambda_d(t_d;P^N,P^F,P^I,H,Z)=-[dS_d(t_d,P^N,P^F,P^I,H,Z)/dt_d]/S_d(t_d,P^N,P^F,P^I,H,Z)$$

Our data set does not contain exact indicators for prices since the nursing home care industry remains restricted to nonprofit facilities and P^N is not determined by competition. Therefore, we use each resident's copayment for nursing home use as a proxy. We also use the level of care a resident receives as a proxy for P^F and the availability of informal care as a proxy for P^I. The proxy for P^F can be justified by the fact that the higher the level of care, the lower is the copayment paid by the elderly because the long-term care insurance takes care of it. The proxy for P^I is justified by the fact that co-resident family members plausibly provide some informal home care and the availability of informal home care affects the demand for outside formal home care. Both proxies are considered to be costs in the health production function for an elderly person. T_d represents a censoring indicator taking a value of one if a resident had exited the nursing home by the cut-off date, September 30, 2000. H stands for health-related individual characteristics. Z is a vector of dummies describing the characteristics of the institution at which a resident resides. We estimate the duration model for two possible underlying distributions, a Cox-proportional and a Weibull distribution.

Tables 2 reports the estimated coefficients. In both estimates, the coefficients on copayments as a proxy for P^N are statistically significant in the case of welfare care

and health care facilities, suggesting that an increase in copayments is likely to lead to an earlier exit from such facilities, as indicated by the greater-than-one hazard ratio. However, this is not the case for medical care facilities. In the Cox-proportional estimates for welfare care facilities, the hazard ratio is 1.017 (95% confidential interval: 1.004-1.030), which is very similar to parametric estimates assuming a Weibull distribution. This value means that the price elasticity of the hazard of exit from welfare care facilities is 1.7. For health care facilities, the hazard ratio based on the Cox-proportional function is estimated at 1.018 (95% confidential interval: 0.997-1.038), which is slightly larger than the one for welfare care facilities. This figure implies that the price elasticity of the hazard of exit from health care facilities is 1.8. The results suggest that own-price effects on the demand for long-term facility care are elastic both in welfare care and health care facilities, but not in medical care facilities where the most medically needy are treated.

Effects of residents' care levels as a proxy for P^F on the demand of institutional care vary among these facilities. Residents in lower care level categories are more likely to be discharged from welfare care facilities (at a 5% significance level). While the probability of discharge from health care facilities increases from lower to higher levels of care, those requiring higher care levels are less likely to be discharged from medical care facilities. The results suggest that long-term institutional care provided by health care facilities is a substitute for formal home care, while that provided by welfare care facilities is a complement to formal home care.

The presence of informal caregivers P^I means that residents are discharged from health and medical care facilities earlier than those with no unpaid caregivers. This suggests that long-term care provided both by health and medical care facilities

acts as a substitute for informal home care. However, this is not the case for residents in welfare care facilities.

In sum, the findings suggest that in order to create a system that shortens the length of an elderly person's nursing home stay, a differentiated approach is necessary, since the price mechanism seems to affect nursing care demand differently in the three types of nursing homes. In the case of welfare care facilities, raising P^N (the cost of nursing home care) and lowering P^F (the cost of formal home care) for those who are less severely ill may shorten the length of residents' stay. An increase in P^N will also shorten the length of nursing home stay for those in health care facilities who need rehabilitation for transition from hospital to home care are. Lowering P^F could also be effective in shortening residents' length of stay, especially in the case of residents requiring greater levels of care. However, in the case of elderly residents in medical care facilities, i.e. the most medically needy, the price mechanism does not seem to work well in shortening stays because of inelastic demand.

THE DETERMINANTS OF NURSING HOME EXIT AND SUBSEQUENT DESTINATION

Our next step is to apply a probit model to the same sample in order to estimate the marginal effect of long-term care prices on residents' destination after nursing home exit. Nursing home stays come to an end for one of three reasons: residents are sent home, they are transferred to another institution, or they die. Figure 1 shows the patterns for the different types of nursing facilities. In the case of residents of welfare care facilities, 4% moved to home care; 3% were transferred to other nursing homes; 32% were re-hospitalized, while 54% died; the remaining 8% stayed on at the same

facility, but in our sample these observations are treated as truncated. In the case of residents of health care facilities, 44% moved to home care; 14% were transferred to another nursing home; 38% were re-hospitalized; 2% died; and 3% stayed on at the same home. Finally, in the case of residents of medical care facilities, 36% moved to home care; 11% were relocated to another facility; 30% were re-hospitalized; 16% died; and 8% remained at the same facility. The differences in these patterns reflect the different functions the three types of facilities fulfill, as explained above. What the data show is that of the elderly residents exiting nursing homes of any type, a large proportion – 30% or more – is transferred to hospitals and clinics. This illustrates clearly how serious the problem of social institutionalization, where residents are rotated among long-term care facilities and hospitals or clinics, is.

Because the aim of this study is to collect evidence relevant to policy information, in this section we focus on those who return to the community after being discharged from a nursing home. Because the aim of this study is to examine policy options to shorten the length of nursing home stays, we now turn our attention to what determines whether nursing home residents return to the community after being discharged or are socially institutionalized by being rotated between long-term care facilities and hospitals or clinics.

Table 3 shows summary statistics of the data used for the probit estimates. The table contains several variables that may be obvious candidates as determinants of nursing home exit, such as copayments as a proxy for P^N, resident's health status as a proxy of P^F, and their family situation as a proxy for P^I. The table also shows that if we compare the copayments facing residents that exit one of the three types of facilities, those exiting health or medical care facilities face more or less the same costs,

no matter whether they move on to home care or are re-hospitalized. In contrast, those exiting welfare care facilities face much lower costs when being re-hospitalized. This finding also implies that welfare care residents face more or less the same copayments as residents of the other facilities when moving to home care. Finally, we can see that, no matter which type of facility residents exit, those requiring greater levels of care and without informal caregivers are more likely to be re-hospitalized.

The results of our probit estimation of the determinants of nursing home care exit are reported in Table 4. The figures in the second row report changes in the probabilities of nursing home exit to home care and hospitals or clinics with respect to a one percentage point change in P^N. The estimates suggest that a one-percentage increase in P^N increases the probably to returning to home care by 0.04 percentage points in the case of welfare care facility residents and by 3.7 percentage points in the case of health care facility residents, while it has no statistically significant effect in the case of medical care facility residents. In contrast, the price effect on the probability of being re-hospitalized is significantly negative in the case of health and medical care facility residents, while there are no statistically significant effects in the case of welfare care facility residents. The estimated elasticity are minus 3.3 percentage points in the case of health care facility residents and minus 1.9 percentage points in the case of medical care facility residents.

Next, we focus on the effects of the care level and the number of co-resident family members as proxies for P^F and P^I.[4] In health care facilities, those whose care level is 4 and 5 are more likely to exit to the community than those requiring the lowest levels of care, while those requiring care level 4 or 5 are less likely to be re-hospitalized. We can also see that both the probability of exiting to the community

and of not being re-hospitalized is larger for the higher care level 5 than for care level 4. Living with family members has a small, but statistically significant effect on the probability of nursing home exit. The presence of co-residents tends to increase the probability of returning to home care and to decrease the probability of being re-hospitalized, in particular for health and medical care residents. Finally, the severer the dementia stage, the smaller is the probability of exit from either health or medical care facilities to home care; and the higher is the probability of being re-hospitalized from health care facilities.

Overall, the results of the probit estimation are consistent with the findings based on the duration estimates. In other words, prices influence an elderly person's destination after exiting a nursing home differently in the different types of nursing homes. Nursing home care provided by welfare and health care facilities is a substitute for home care because raising P^N increases the probability of exit to home care. Also, nursing home care provided by either health or medical care facilities is a complement to hospital care since raising P^N reduces the probability of exit to a hospital or clinic. For health care facilities, therefore, an increase in P^N reduces both the number of residents by moving them to home care and the number of residents who are rotated among health care facilities and hospitals or clinics.

DISCUSSION AND CONCLUSION

Using census data from the *Survey on Care Service Providers* (*Kaigo Service Shisetsu Jigyosho Chosa)*, this paper addressed two questions: one is how the price mechanism can be used to shorten the length of elderly residents' stay in nursing homes; the other is how the price mechanism can be used to reduce the number of socially

institutionalized elderly residents by inducing them to return to home care.

This study suffers from four limitations. First, the study could not evaluate the determinants of "nursing home entry" since the survey includes only those who are already institutionalized. If it were possible to obtain information on elderly persons' circumstances before they entered nursing homes, we might be able to examine how prices influence their choice regarding the type of nursing care facility (i.e., welfare, health, or medical care facility). In order to solve the problem of social institutionalization, it is important to assess how large the potential demand for care facilities within the community is. Second, it would have been desirable to estimate the income elasticity of demand for institutional care. Again, this was impossible because of the lack of data that could be used to determine an elderly person's economic status, such as income, assets, or education. Third, as stated earlier, our sample may overestimate the length of nursing home stays because of missing data. This sample selection bias may be more serious in the case of our data on residents in welfare care facilities, since most residents in these facilities tend to stay for long period, often until their death. Fourth, if we could use information on socially hospitalized patients , it would be possible to investigate how the price mechanism effects the exit of residents from hospitals.

Despite its limitations, this study points the way to a possible solution for the problem of social institutionalization and the associated burgeoning costs of the medical system in Japan. An appropriate price policy may work well to shorten residents' length of stay and to reduce the number of socially institutionalized residents. Since the effects of the introduction of a price mechanism may differ for different types of facilities, policies aimed at broadening residents' range of choices need to be designed

with care and incorporate an appropriate risk adjustment system to provide a safety net for those among the elderly who are at risk of becoming socially institutionalized.

NOTES

[1] This is a revised version of our earlier paper (Noguchi and Shimizutani 2002). The research originated in a study on Japan's long-term care conducted by the Price Policy Division of the Cabinet Office. We would like to thank Koichi Kawabuchi, Shuzo Nishimura, Takashi Oshio for their comments and the Ministry of Health, Labour and Welfare for providing us with their valuable data set. The views expressed in this paper do not necessarily represent those of the Economic and Social Research Institute or of the Japanese government.

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[2] Before the introduction of the long-term care insurance scheme, the decision which services to provide for the elderly rested with local governments. In most cases, long-term care services for the elderly were provided free of charge, but patients could not choose the care facility or what service they would receive.

[3] Due to the scarcity of welfare care homes in Japan, there are long waiting lists for this type of nursing home. Those who are not admitted to a welfare care facility tend to enter health care facilities though they do not need medical care. As a result, health care facilities have come to be called "second welfare care facilities."

[4] We also included interactive terms of copayments and care levels in the regression; however, none of the coefficients were statistically significant.

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Table 1: Summary statistics of key variables, by type of nursing home

Variable	Welfare care facility Mean (Standard deviation) (n=1,556)	Health care facility Mean (Standard deviation) (n=14,134)	Medical care facility Mean (Standard deviation) (n=2,828)
Length of stay in facility (days)	1440.210	185.338	394.764
	(1436.950)	(242.909)	(650.983)
Natural log of individual co-payment	5.833	9.126	8.843
	(4.202)	(1.906)	(2.805)
=1 for care level 1 a/	0.067	0.165	0.094
	(0.250)	(0.371)	(0.291)
=1 for care level 2	0.083	0.208	0.111
	(0.276)	(0.406)	(0.314)
=1 for care level 3	0.154	0.222	0.148
	(0.361)	(0.416)	(0.355)
=1 for care level 4	0.294	0.244	0.276
	(0.456)	(0.429)	(0.447)
=1 for care level 5	0.395	0.156	0.353
	(0.489)	(0.363)	(0.478)
=1 if informal care available	0.202	0.266	0.239
	(0.373)	(0.379)	(0.376)
=1 if male	0.733	0.708	0.650
	(0.443)	(0.455)	(0.477)
Age	85.153	83.432	81.915
	(7.828)	(7.461)	(9.094)
=1 for dementia stage 1 b/	0.056	0.135	0.102
	(0.230)	(0.342)	(0.302)
=1 for dementia stage 2	0.134	0.249	0.151
	(0.341)	(0.432)	(0.358)
=1 for dementia stage 3	0.243	0.330	0.218
	(0.429)	(0.470)	(0.413)
=1 for dementia stage 4	0.372	0.143	0.246
	(0.484)	(0.350)	(0.431)
=1 for dementia stage 5	0.137	0.022	0.147
	(0.344)	(0.147)	(0.354)
=1 for disability stage 1 c/	0.130	0.400	0.178
	(0.336)	(0.490)	(0.383)
=1 for disability stage 2	0.251	0.388	0.269
	(0.434)	(0.487)	(0.444)
=1 for disability stage 3	0.602	0.184	0.500
	(0.490)	(0.387)	(0.500)

Table 2: Determinants of long-term care facility exit

Variable	Cox-proportional hazard estimates												Weibull estimates											
	From welfare care facility				From health care facility				From medical care facility				From welfare care facility				From health care facility				From medical care facility			
	Haz. Ratio (Std. error)	95% confidential interval			Haz. Ratio (Std. error)	95% confidential interval			Haz. Ratio (Std. error)	95% confidential interval			Haz. Ratio (Std. error)	95% confidential interval			Haz. Ratio (Std. error)	95% confidential interval			Haz. Ratio (Std. error)	95% confidential interval		
Log likelihood	**-8749.5716**				**-117313.05**				**-18576.449**				**-2224.4436**				**-23171.301**				**-4871.4212**			
Natural log of individual co-payment	1.017	1.004	1.030	***	1.018	0.997	1.038	**	1.002	0.983	1.021		1.018	1.006	1.030	***	1.019	0.993	1.047	*	1.005	0.983	1.026	
	(0.007)				(0.010)				(0.010)				(0.006)				(0.014)				(0.011)			
=1 for care level 2	1.946	0.824	4.598	*	2.144	1.698	2.706	***	0.553	0.388	0.790	***	1.973	0.944	4.123	**	2.222	1.822	2.709	***	0.583	0.376	0.905	***
	(0.854)				(0.255)				(0.100)				(0.742)				(0.225)				(0.131)			
=1 for care level 3	2.048	0.870	4.822	*	2.251	1.783	2.842	***	0.494	0.348	0.702	***	2.058	0.990	4.278	**	2.357	1.934	2.872	***	0.503	0.323	0.782	***
	(0.895)				(0.268)				(0.088)				(0.768)				(0.238)				(0.113)			
=1 for care level 4	1.591	0.672	3.768		2.318	1.833	2.930	***	0.495	0.350	0.701	***	1.640	0.774	3.477		2.437	1.997	2.974	***	0.518	0.334	0.801	***
	(0.700)				(0.277)				(0.088)				(0.629)				(0.247)				(0.115)			
=1 for care level 5	1.366	0.572	3.259		2.492	1.961	3.166	***	0.423	0.302	0.594	***	1.390	0.642	3.009		2.633	2.141	3.237	***	0.442	0.285	0.686	***
	(0.606)				(0.304)				(0.073)				(0.548)				(0.278)				(0.099)			
=1 if informal care availab	1.116	0.819	1.521		1.078	0.997	1.166	**	1.143	1.038	1.258	***	1.100	0.811	1.491		1.083	0.993	1.181	**	1.158	1.039	1.290	***
	(0.176)				(0.043)				(0.056)				(0.171)				(0.048)				(0.064)			
=1 if male	0.797	0.700	0.909	***	0.892	0.859	0.926	***	0.813	0.747	0.884	***	0.804	0.704	0.918	***	0.887	0.851	0.925	***	0.810	0.737	0.891	***
	(0.053)				(0.017)				(0.035)				(0.054)				(0.019)				(0.039)			
Age	1.057	0.946	1.182		0.952	0.921	0.983	***	1.068	1.012	1.128	***	1.054	0.954	1.165		0.953	0.920	0.987	***	1.077	1.018	1.139	***
	(0.060)				(0.016)				(0.030)				(0.054)				(0.017)				(0.031)			
Squared age	1.000	0.999	1.000		1.000	1.000	1.000	***	1.000	0.999	1.000	***	1.000	0.999	1.000		1.000	1.000	1.000	***	0.999	0.999	1.000	***
	(0.000)				(0.000)				(0.000)				(0.000)				(0.000)				(0.000)			
=1 for dementia stage 1	1.391	1.003	1.928	***	1.012	0.947	1.082		1.014	0.865	1.189		1.373	0.997	1.890	**	1.019	0.950	1.092		1.016	0.839	1.230	
	(0.232)				(0.034)				(0.082)				(0.224)				(0.036)				(0.099)			
=1 for dementia stage 2	1.368	1.036	1.806	***	0.920	0.867	0.977	***	0.967	0.836	1.118		1.347	1.049	1.730	***	0.915	0.858	0.976	***	0.962	0.808	1.144	
	(0.194)				(0.028)				(0.072)				(0.172)				(0.030)				(0.085)			
=1 for dementia stage 3	1.307	1.001	1.706	***	0.829	0.781	0.879	***	0.955	0.829	1.102		1.283	1.020	1.613	***	0.819	0.769	0.873	***	0.940	0.794	1.112	
	(0.178)				(0.025)				(0.069)				(0.150)				(0.026)				(0.081)			
=1 for dementia stage 4	1.385	1.062	1.807	***	0.761	0.709	0.816	***	0.947	0.821	1.093		1.361	1.076	1.722	***	0.745	0.690	0.805	***	0.935	0.789	1.109	
	(0.188)				(0.027)				(0.069)				(0.163)				(0.029)				(0.081)			
=1 for dementia stage 5	1.428	1.070	1.906	***	0.838	0.738	0.952	***	0.946	0.805	1.111		1.396	1.082	1.801	***	0.824	0.712	0.954	***	0.946	0.791	1.132	
	(0.210)				(0.054)				(0.078)				(0.182)				(0.062)				(0.087)			
=1 for disability stage 1	0.672	0.275	1.644		1.001	0.680	1.471		0.633	0.469	0.853	***	0.666	0.330	1.345		0.985	0.698	1.391		0.651	0.462	0.916	***
	(0.307)				(0.197)				(0.097)				(0.239)				(0.173)				(0.114)			
=1 for disability stage 2	0.589	0.240	1.444		0.955	0.648	1.405		0.587	0.438	0.788	***	0.583	0.286	1.187	*	0.935	0.662	1.321		0.600	0.428	0.839	***
	(0.269)				(0.188)				(0.088)				(0.212)				(0.165)				(0.103)			
=1 for disability stage 3	0.566	0.230	1.393		0.935	0.633	1.379		0.557	0.416	0.744	***	0.564	0.275	1.160	*	0.911	0.643	1.291		0.550	0.390	0.775	***
	(0.260)				(0.185)				(0.083)				(0.207)				(0.162)				(0.096)			

Figure 1: Patients' status after exit from nursing home, by type of facility

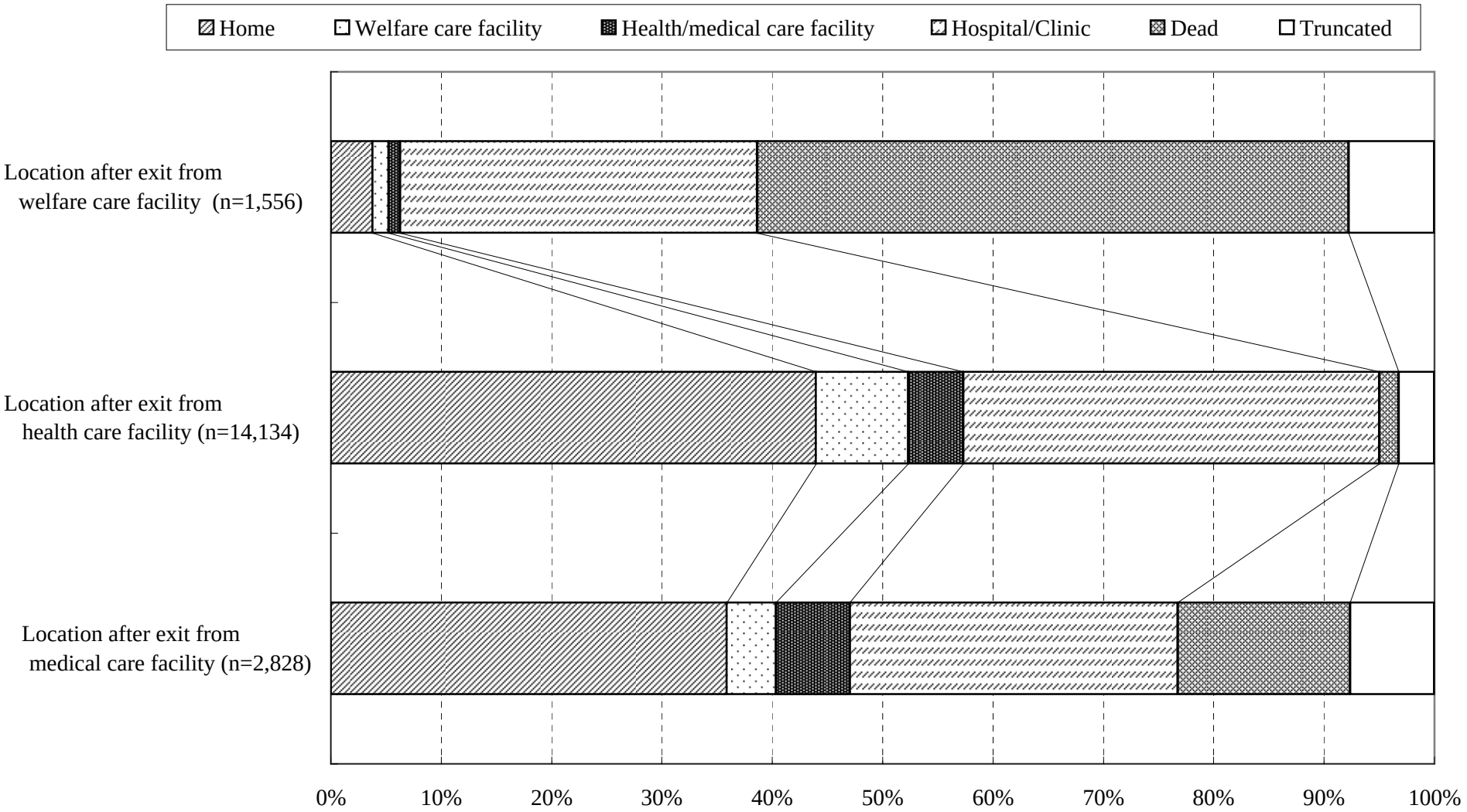

Table 3: Summary statistics for marginal effects of co-payment on nursing home exit by type of facility

Variable (Standard deviation)	Exit from welfare care facility		Exit from health care facility		Exit from medical care facility	
	Home care (n=56)	Hospital or Clinic (n=502)	Home care (n=6,211)	Hospital or Clinic (n=5,323)	Home care (n=616)	Hospital or Clinic (n=877)
Natural log of individual co-payment	8.152	5.243	9.284	9.020	8.710	8.782
	(3.236)	(4.360)	(1.684)	(2.033)	(3.058)	(2.913)
=1 for care level 1	0.232	0.088	0.226	0.121	0.264	0.080
	(0.397)	(0.397)	(0.389)	(0.413)	(0.388)	(0.394)
=1 for care level 2	0.214	0.092	0.233	0.184	0.198	0.103
	(0.414)	(0.289)	(0.423)	(0.388)	(0.399)	(0.304)
=1 for care level 3	0.196	0.151	0.225	0.215	0.192	0.121
	(0.401)	(0.359)	(0.418)	(0.411)	(0.394)	(0.326)
=1 for care level 4	0.179	0.285	0.208	0.272	0.177	0.295
	(0.386)	(0.452)	(0.406)	(0.445)	(0.382)	(0.456)
=1 for care level 5	0.179	0.384	0.108	0.208	0.169	0.401
	(0.386)	(0.487)	(0.310)	(0.406)	(0.375)	(0.490)
=1if living with spouse	0.304	0.050	0.241	0.248	0.373	0.331
	(0.464)	(0.218)	(0.428)	(0.432)	(0.484)	(0.471)
=1 if living with son	0.429	0.163	0.534	0.490	0.468	0.412
	(0.499)	(0.370)	(0.499)	(0.500)	(0.499)	(0.492)
=1 if living with daughter	0.196	0.295	0.203	0.162	0.151	0.154
	(0.401)	(0.456)	(0.402)	(0.368)	(0.358)	(0.361)
=1 if living with daughter-in-law	0.375	0.122	0.481	0.426	0.399	0.293
	(0.489)	(0.327)	(0.500)	(0.495)	(0.490)	(0.455)
=1 if living with son-in-law	0.071	0.239	0.123	0.090	0.076	0.079
	(0.260)	(0.427)	(0.329)	(0.287)	(0.266)	(0.269)
=1 if living with father or mother	0.268	0.060	0.002	0.003	0.011	0.010
	(0.447)	(0.237)	(0.046)	(0.058)	(0.106)	(0.101)
=1 if living with grandson or granddaughter	0.054	0.195	0.390	0.331	0.321	0.274
	(0.227)	(0.397)	(0.488)	(0.470)	(0.467)	(0.446)
=1 if living alone	0.089	0.127	0.096	0.157	0.122	0.179
	(0.288)	(0.334)	(0.295)	(0.364)	(0.327)	(0.384)
=1 if male	0.768	0.273	0.738	0.666	0.640	0.631
	(0.426)	(0.446)	(0.440)	(0.472)	(0.481)	(0.483)
Age	82.357	84.076	83.262	83.490	79.894	80.608
	(8.804)	(8.097)	(7.415)	(7.578)	(9.447)	(9.581)
=1 for dementia stage 1	0.161	0.050	0.171	0.104	0.174	0.095
	(0.371)	(0.218)	(0.377)	(0.305)	(0.379)	(0.293)
=1 for dementia stage 2	0.321	0.143	0.272	0.225	0.205	0.144
	(0.471)	(0.351)	(0.445)	(0.418)	(0.404)	(0.351)
=1 for dementia stage 3	0.214	0.243	0.285	0.361	0.183	0.228
	(0.414)	(0.429)	(0.451)	(0.480)	(0.387)	(0.420)
=1 for dementia stage 4	0.161	0.371	0.092	0.195	0.112	0.290
	(0.371)	(0.483)	(0.289)	(0.397)	(0.316)	(0.454)
=1 for dementia stage 5	0.054	0.133	0.012	0.032	0.045	0.135
	(0.227)	(0.340)	(0.108)	(0.175)	(0.208)	(0.341)
=1 for disability stage 1	0.054	0.008	0.037	0.014	0.075	0.015
	(0.227)	(0.089)	(0.189)	(0.116)	(0.263)	(0.121)
=1 for disability stage 2	0.411	0.137	0.469	0.297	0.352	0.130
	(0.496)	(0.345)	(0.500)	(0.457)	(0.478)	(0.336)
=1 for disability stage 3	0.250	0.277	0.358	0.418	0.300	0.275
	(0.437)	(0.448)	(0.479)	(0.493)	(0.459)	(0.447)

Table 4: Marginal effect of co-payment on nursing care exit by type of facility: Probit estimate

Variable (Standard errors)	Exit from welfare care facility to:		Exit from health care facility to:		Exit from care medical care facility:	
	Home care	Hospital or Clinic	Home care	Hospital or Clinic	Home care	Hospital or Clinic
Constant	-0.0305	0.2721	0.9093 **	-1.3629 **	0.0111	-0.4005 **
	(0.3016)	(0.7876)	(0.2046)	(0.2061)	(0.1123)	(0.1416)
Natural log of individual co-payment	0.0004 **	-0.0044	0.0365 **	-0.0326 **	0.0003	-0.0191 **
	(0.0018)	(0.0045)	(0.0043)	(0.0043)	(0.0035)	(0.0044)
=1 for care level 2	-0.0012	-0.0164	-0.0261 *	0.0182	-0.0248	0.0284
	(0.0271)	(0.0695)	(0.0129)	(0.0130)	(0.0313)	(0.0394)
=1 for care level 3	-0.0004	-0.1082	0.0077	-0.0227	-0.0302	-0.0485
	(0.0260)	(0.0664)	(0.0137)	(0.0138)	(0.0324)	(0.0408)
=1 for care level 4	-0.0009	-0.1228 *	0.0595 **	-0.0996 **	-0.0675 **	-0.0146
	(0.0269)	(0.0685)	(0.0153)	(0.0154)	(0.0329)	(0.0415)
=1 for care level 5	-0.0013	-0.0842	0.1076 **	-0.1221 **	-0.0166	-0.0060
	(0.0273)	(0.0696)	(0.0182)	(0.0183)	(0.0349)	(0.0439)
=1if living with spouse	0.0010	-0.0918 *	0.0663 **	-0.0480 **	0.0591 **	-0.0003
	(0.0176)	(0.0453)	(0.0120)	(0.0120)	(0.0218)	(0.0275)
=1 if living with son	-0.0006	-0.0806	0.0283 *	-0.0258	-0.0277	0.0715 **
	(0.0190)	(0.0487)	(0.0140)	(0.0141)	(0.0248)	(0.0312)
=1 if living with daughter	0.0010	-0.0218	0.0818 **	-0.0457 **	0.0366	-0.0005
	(0.0232)	(0.0597)	(0.0168)	(0.0169)	(0.0311)	(0.0391)
=1 if living with daughter-in-law	0.0016	0.0269	0.0909 **	-0.0311 **	0.0890 **	-0.1221 **
	(0.0187)	(0.0478)	(0.0137)	(0.0138)	(0.0254)	(0.0320)
=1 if living with son-in-law	0.00003	0.0562	0.0563 **	-0.0375 *	0.0090	0.0091
	(0.0300)	(0.0763)	(0.0182)	(0.0183)	(0.0380)	(0.0479)
=1 if living with father or mother	-0.00004	0.0007	0.0240	-0.0232	0.0079	0.0088
	(0.0159)	(0.0409)	(0.0096)	(0.0096)	(0.0199)	(0.0250)
=1 if living with grandson or granddaughter	-0.0029 *	0.0474	0.0474 **	-0.0305 **	-0.0345	0.0419
	(0.0220)	(0.0566)	(0.0161)	(0.0162)	(0.0308)	(0.0388)
=1 if living alone	-0.0022	-0.0872	-0.2019 **	0.0639	-0.0907	0.1470 **
	(0.0222)	(0.0571)	(0.0359)	(0.0362)	(0.0483)	(0.0607)
=1 if male	0.0013	-0.0237	0.0594 **	-0.0698 **	0.0236	-0.0212
	(0.0125)	(0.0321)	(0.0095)	(0.0096)	(0.0168)	(0.0212)
Age	0.00001	0.0013	-0.0001	0.0001	0.0069	0.0004 **
	(0.0001)	(0.0002)	(0.0001)	(0.0001)	(0.0001)	(0.0002)
Squared age	-0.000001 *	-0.00005 **	-0.00001	-0.000005	-0.0001	-0.00003 **
	(0.000004)	(0.00001)	(0.000004)	(0.000004)	(0.00001)	(0.00001)
=1 for dementia stage 1	0.0023 *	-0.0186	-0.0489 **	0.0175	-0.0264	0.0433
	(0.0305)	(0.0782)	(0.0151)	(0.0152)	(0.0302)	(0.0380)
=1 for dementia stage 2	0.0014	0.0472	-0.0973 **	0.0408 **	-0.0445 **	0.0327
	(0.0265)	(0.0679)	(0.0140)	(0.0141)	(0.0282)	(0.0355)
=1 for dementia stage 3	0.0016	0.0544	-0.1287 **	0.0479 **	-0.0484 **	0.0336
	(0.0269)	(0.0689)	(0.0153)	(0.0154)	(0.0286)	(0.0360)
=1 for dementia stage 4	0.0014	0.0850	-0.1686 **	0.0857 **	-0.0796 **	0.0405
	(0.0275)	(0.0705)	(0.0184)	(0.0186)	(0.0296)	(0.0373)
=1 for dementia stage 5	0.0003	0.0636	-0.2120 **	0.1094 **	-0.0715 **	-0.0510
	(0.0297)	(0.0763)	(0.0302)	(0.0304)	(0.0330)	(0.0416)
=1 for disability stage 1	0.0004	-0.3200	0.0784	0.0094	-0.0709	0.0859
	(0.0857)	(0.2196)	(0.0903)	(0.0909)	(0.0637)	(0.0802)
=1 for disability stage 2	-0.0005	-0.1818	0.0667	0.0580	-0.0915 **	0.1693 **
	(0.0752)	(0.1922)	(0.0875)	(0.0882)	(0.0523)	(0.0658)
=1 for disability stage 3	-0.0006	-0.1448	-0.0148	0.1219	-0.1109 **	0.2169 **
	(0.0771)	(0.1967)	(0.0880)	(0.0887)	(0.0552)	(0.0695)

Note: ***, **, and * indicate significance at the 5%-, 10%-, and 15%-significance level, respectively. All regressions are controlled for facility dummies. The definitions of care level, dementia, and disability stages are shown in the footnotes for Table 1