

Fig. 3 Percentages of Home and Institutions stratified by Care-Level

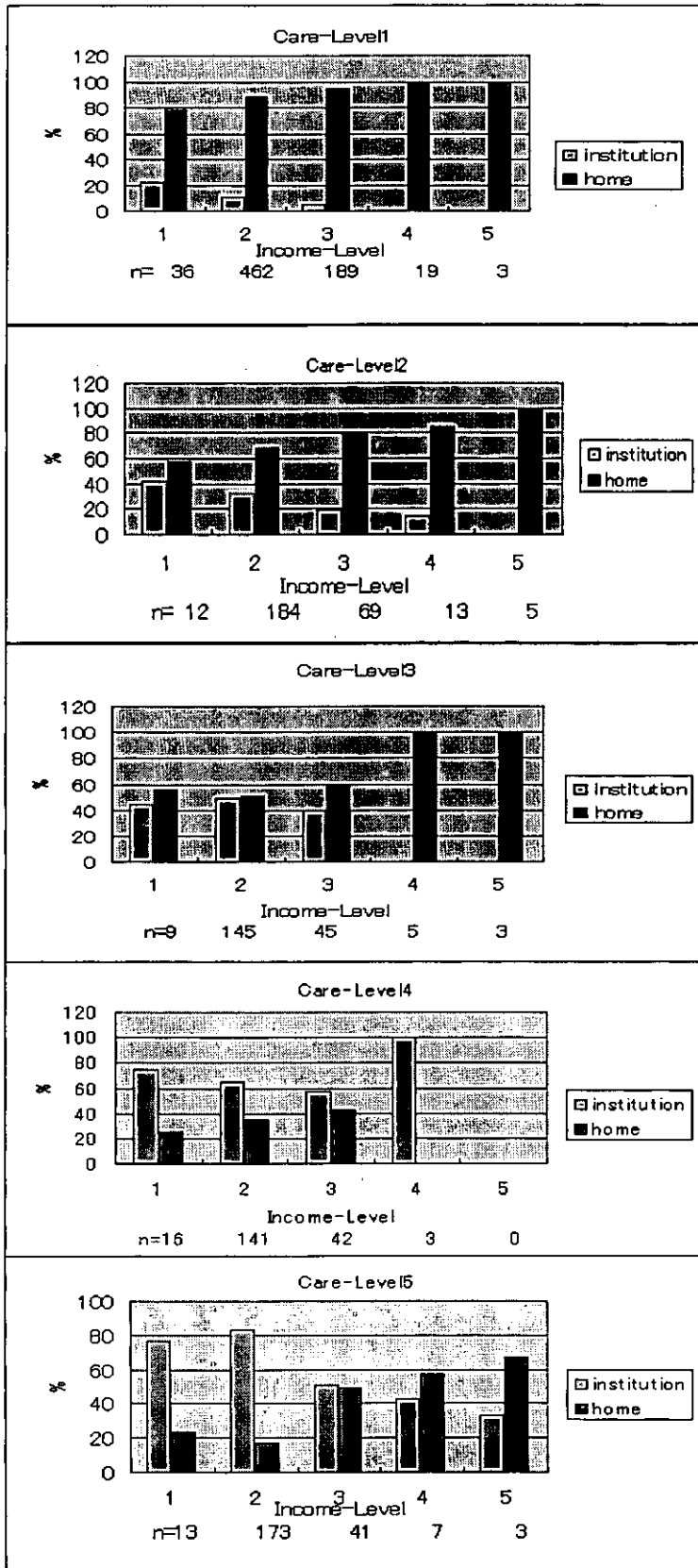


Fig.4 Proportion of living alone by Income-Level

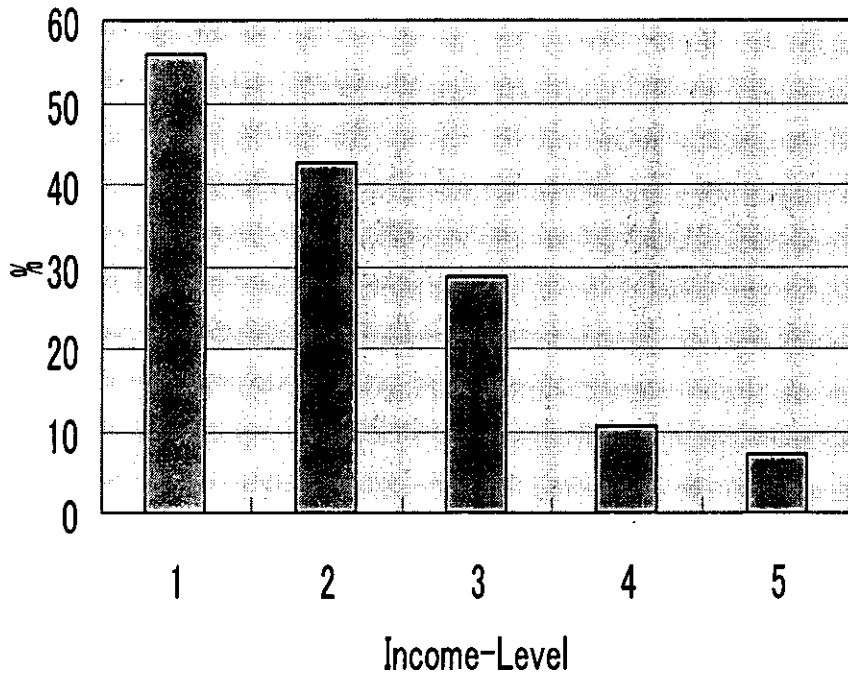
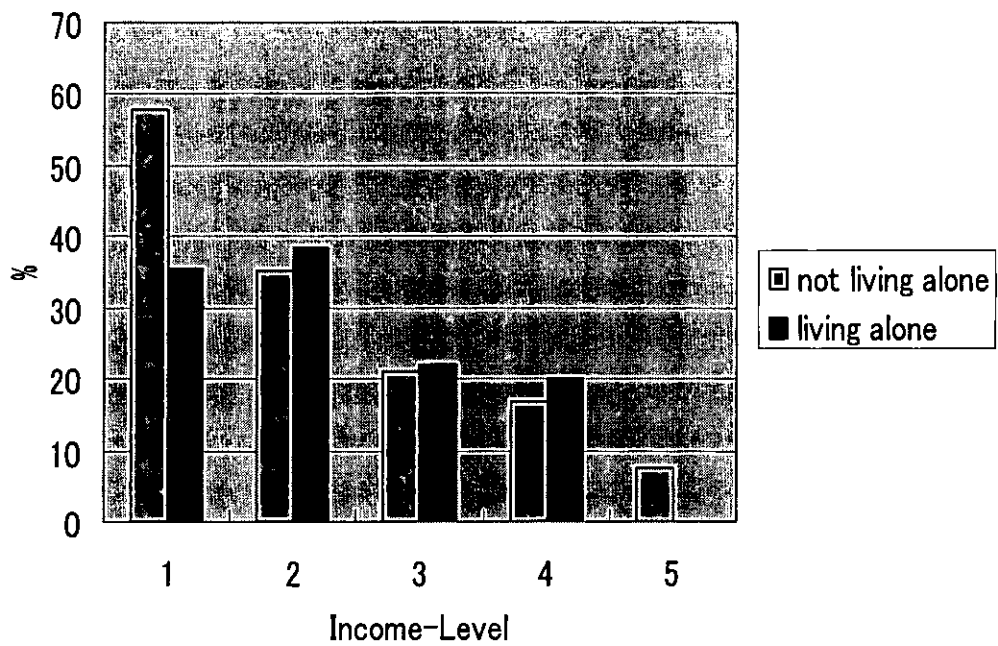


Fig.5. Proportion of Institutional Care by Income-Level
(stratified by living alone or not)



Title: Gender difference in the pattern of status transition among Japanese rural elderly under Long Term Care Insurance.

Hideki Hashimoto, DrPH¹, Nanako Tamiya, MD, Dr Med. Sci.², Mikiya Sato, MD¹, Eiji Yano, MD,

Dr Med. Sci.¹.

1 Department of Hygiene and Public Health, Teikyo University School of Medicine
2 Department of Social Medicine, Tsukuba University

Corresponding author; Hideki Hashimoto

Department of Hygiene and Public Health
Teikyo University School of Medicine
2-11-1 Kaga
Itabashi, Tokyo 173-8605, Japan
Phone int+81-3-3964-1211 (ext 2177)
Fax int+81-3-3964-1058
E-mail: hhashimo@med.teikyo-u.ac.jp

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Running title (35 characters): Gender difference in status transition

ABSTRACT (170 words)

Objectives: To identify gender difference in functional transition and its predictors among Japanese elderly under the Long Term Care Insurance (LTCI).

Design: A retrospective cohort study with 1-year follow-up.

Setting: LTCI claim data and death certification provided by municipal authorities in southern Japan.

Participants: Total of 750 residents of age 65 and older, registered between April, 2000 and March, 2001.

Measurements: Eligibility care levels, demographics, and comorbidity. Death and level transitions after 1 year were predicted using polynomial logistic regression analysis.

Results: Females were older, with better baseline function, and without stroke. One-year mortality was 15.3% in males and 8.6% in females. Baseline care level was a significant predictor of mortality and of improvement. Females were more likely to stay in the baseline level. Cerebro-vascular disease was associated with decline among males, whereas it was associated with improvement among females.

Conclusion: There was a significant gender difference in the pattern of functional transitions, implying that gender should be taken into account in clinical and policy decision making for elderly care.

Keywords;

Long-Term Care Insurance (LTCI), Japan, functional transition, 1-year mortality, gender
difference

INTRODUCTION

It is important to identify predictors of functional decline and mortality among the elderly so that preventive countermeasure could be developed.¹ Although previous studies provided useful information, competing risks among functional decline, functional improvement, death, and drop-out from survey follow-up were often insufficiently taken into consideration to avoid selection bias in the analysis.^{2 3} Besides, previous studies ignored gender difference. Female elderly tend to have a longer life expectancy, yet their proportion of healthy life expectancy is shorter than that of males,⁴ suggesting that the patterns and predictors of functional transition might be different between genders.⁵

In this study, data derived from a retrospective cohort of fragile elderly in a Japanese local community were analyzed to investigate the gender difference in baseline characteristics, the pattern of functional transition and mortality, and their predictors. Using claim data of the public Long Term Care Insurance (LTCI) and death certification data, a complete follow-up of all the registered residents for 1 year was achieved. Discussion on the observed gender difference and its implication for long-term care policy followed analytic findings.

METHODS

Long Term Care Insurance System in Japan

Japanese LTCI, started since 2000, is a mandate social insurance that covers all the Japanese residents of age 40 and over without any selection. The insured, when they become in need of care, will apply to the Local Care Needs Assignment Committee who decides whether the applicants meet the care eligibility criteria according to a standardized nationwide protocol, which reflects the applicant's physical and/or cognitive functions, but not socio-economic conditions. Eligibility criteria assign 6 care levels. Higher care levels mean worse functional status. For example, level 1 means "minor assist needed in daily activity," and level 6 means bed-ridden and completely dependent status. Each care level corresponds to an upper limit of monthly reimbursement that the insurance covers.^{6,7} Since functional levels of the beneficiary elderly would change over time, the assignment of the eligible care level is re-evaluated at least every 6 month by the municipal committee.

Subjects and Measurement

The current study was conducted as a secondary data analysis using LTCI claim data that were provided by municipal insurers in six rural towns of Kimotsuki County, Kagoshima Prefecture, a southern rural area of Japan. In the 2000 census, there were

approximately 52,000 residents, of which 30% were 65 years or older, the proportion higher than the national average of 17%. During the period between April 1, 2000 and March 31, 2001, 750 residents of age 65 and older were newly registered as service users in the local LTCI. These registered beneficiaries were followed up for one year since the initial registration. Following data were electronically retrieved from the LTCI registration; age, gender, eligibility care level (re-categorized from 6 levels to 3 levels; Level 1&2, 3&4, and 5&6 were combined), date when the eligibility was approved, the place of care at registration (institutionalized / hospitalized, or at home), the level of dementia (originally 8 levels, re-categorized into 3; none, mild, severe), and clinical diagnoses that were causally related to beneficiaries' conditions. These diagnoses were categorized into cerebro-vascular (e.g. stroke), musculo-skeletal (e.g. arthritis), neurological (e.g. Parkinson disease), and other diseases. Electronic data on vital statistics were also provided by the same municipal authorities, and were merged with the registration data. To keep data confidentiality, the municipal authorities provided the research team with anonymous data without privacy information such as names and addresses. The current study was also approved by the internal review board in the institution that the first author was affiliated with.

Analysis

Descriptive statistics were compared between genders using Chi-square test.

One-year outcome was categorized into four categories (improved care levels, declined care levels, unchanged care levels, and dead status). Unchanged status was regarded as the reference level. Then, the polynomial logistic regression model was used to predict the outcome. Following variables were considered as candidate predictors in the logistic regression model; age (65-74, 75-84, >=85), eligibility care levels, severity of dementia, comorbidity diagnoses, and places of care at registration time. An initial model included gender as an independent variable. Then its interaction terms with other candidate variables were tested. When the interaction was found significant, stratified analysis by gender was separately conducted. All the statistical analysis was performed with STATA ver. 7.0 Special Edition (STATA Corporation, TX, USA).

RESULTS

Table 1 shows the baseline characteristics of the studied subjects. Female beneficiaries were older than male ones (mean±SD; 78.6 ± 6.8 years for males vs. 81.2 ± 7.0 years for females). Females were more likely to be in the lowest care level, to be without cerebro-vascular diseases, and to be taken care of at home at registration. Females were more likely to stay in the same care level after 1-year follow-up. One-year mortality was 15.3% in males and 8.6% in females ($P < .001$).

Table 2 shows results of polynomial logistic regression analysis to predict the outcome after 1 year. Since the initial place of care, and diagnoses of neurological and musculo-skeletal diseases did not show a significant relationship with outcome categories, they were not included in final multi-variable models shown in the table. The left column shows results of a model including both genders. Gender was a significant predictor of functional improvement and mortality; females tended to get improved and less likely to be dead. Eligibility care level at registration was also significant in predicting functional improvement and mortality. Those with higher care levels tended to have a higher chance of functional improvement, and yet suffered a higher chance of death. When the interaction of gender with other covariates were tested, an interaction term with cerebro-vascular diseases was significant for predicting functional improvement ($p=0.007$), and an interaction term with care levels was significant for predicting

one-year mortality ($p=0.008$).

The middle and right columns of Table 2 show results stratified by gender. Predictors of functional decline and improvement were not different across genders except for the diagnosis of cerebro-vascular diseases. Among males, those with cerebro-vascular diseases had a higher chance of functional decline, whereas the reverse was observed among females. Age was significantly related to one-year mortality among males, but not among females. The initial care level was a significant predictor of functional improvement and one-year mortality in both genders, though the odds were much higher among females than among males.

DISCUSSION

Previous studies identified that male gender and worse baseline function were risk factors of mortality among the elderly in communities^{1, 3} and among the elderly after hospitalization.⁸ Comorbidity such as stroke, on the other hand, was not significant once age, sex, and baseline function were controlled for.¹ Results of this study also showed that females had a lower risk of death, and those with initially higher care level had a higher risk of death when both genders were included in the analysis.

However, our analysis revealed findings that might deserve a closer look. Age was significantly related to higher mortality only among males. Initial care level was a predictor of mortality, and at the same time that of functional improvement. Comorbidity of cerebro-vascular disease was a predictor of functional decline among males, but it was a predictor of functional improvement among females.

This study focused on functional status change over time, rather than on functional status at a later time as previous studies did.³ The rationale was that a non-ignorable portion of the disabled elderly would show improvement even from the severest status. Even if one ends up in moderate functional impairment, it would be different whether one has improved from severe to moderate, has declined from mild to moderate, or has stayed moderate over time. Results of this study showed that those with worse baseline functional status had a higher risk

of death, but also they had a better chance to get improved. Those with milder functional status , on the other hand, tended to stay in the initial functional level.

The results also showed that the odds for death and functional improvement were higher among females, suggesting that interventions to avoid death and to enhance functional improvement should be more encouraged among female elderly with disability. The effect of cerebro-vascular comorbidity also had distinctive effects on functional transition across genders. Previously, it was reported that the incidence of stroke attack is higher among males, but case fatality and the likelihood of functional impairment is higher among females.^{9, 10} Since the studied subjects were survivors over the acute phase of stroke attack and other clinical conditions, females with comorbidity may paradoxically face a higher risk of death and a higher chance of functional recovery.

As previous studies also found, it was identified that dementia was a significant predictor of functional decline.¹¹ In the current study, mild dementia, even after control for initial care levels, significantly predicted functional decline in both genders.

This study had an advantage in that all the registered beneficiaries during a study period in the targeted community were completely followed for one year, thanks to electronic registration records and death certification provided by municipal authorities. Previous studies that investigated status transitions over time suffered non-ignorable attrition from the study.²

Drop-out might cause selection bias in the estimation of predictors.

Another advantage of this study was that all the beneficiaries were assessed with a *standardized computerized protocol for the assignment of the eligibility care level*. The eligibility care level classification was developed in a large study that investigated the relationship between functional status and needed time resource for care.⁷ Although the classification system has been criticized in some algorithm flaws, an empirical study showed that it generally reflected the level of physical and cognitive function of targeted elderly.¹²

Although descriptive statistics provided through this study would help identifying the niche for clinical intervention and policy making for long-term care of the disabled elderly, several limitations should be mentioned. Firstly, since the studied sample was derived from a limited rural region, the transition pattern and predictors may not be generalizable to other regions in Japan and other countries. However, distinctive transition patterns between genders were also observed in previous studies. Beland et al. found that the female tended to enter and remain in mild impairment levels.⁵ Okochi, et al. also identified, in a cohort of Japanese community, that a large portion of the elderly stayed in the initial functional class, though the transition pattern differed across age categories and gender.¹³ They reported that male residents had higher chance to get functional deterioration than female residents. These findings in and outside of Japan were consistent with the results obtained in this study.

In this study, a focus was put only on the applicant's care levels, clinical conditions, and demographic factors. Since the LTCI assigns eligibility care levels exclusively based on physical and cognitive functional status of the beneficiary, but not on socio-economic conditions, the LTCI claim data did not include information such as household income and family composition. Previous studies identified that functional levels of the frail elderly are affected not only by clinical and functional conditions, but also by socio-economic factors such as educational levels,^{2, 14, 15} social support and network,^{16, 17} and household income.¹⁸ Gender difference found in this study might be confounded by these socio-economic or psychosocial characteristics, and it might be attenuated once these variables were taken into consideration. It should be clarified in a future study whether gender difference would interact with clinical, functional, and socioeconomic factors to determine status transitions of the frail elderly under the LTCI.

Gender difference among the cared elderly is often strikingly seen in the characteristics of their caregivers. Males tend to be cared by their female spouses in this country.¹⁹ It is speculated that males were more likely to have informal care by female spouses, whereas females were likely to be widowed, and to rely on public services provided by the LTCI system. Since those who have not been registered in the LTCI were beyond our sample, however, the effects of informal care on functional transitions also have to wait for further

investigation.

To conclude, the current study demonstrated the pattern of status transitions among the frail elderly in a Japanese rural community based on public registration data for the long-term care insurance. The pattern and its predictors differed between genders. The observed difference implies that the gender should be taken into account in clinical intervention and policy making to prevent functional deterioration and death of the elderly in needs.

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